

FRUIT FLIES OF FLORIDA
(DIPTERA: TEPHRITIDAE)

By

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Dedicated

To these wonderful beings
my husband, Yusoh and children
Sharila and Melissa Johannie

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Abstract of Dissertation Presented to the Graduate Council
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FRUIT FLIES OF FLORIDA (DIPTERA: TEPHRITIDAE)

By

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June 1980

Chairman: Dr. D. H. Habeck

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Major Department: Department of Entomology and Nematology

The fruit fly fauna of Florida was studied for the first time. Keys to genera and species are given along with descriptions of the 24 genera and 56 species including one new species. Data are presented in the following format: Synonymy, diagnosis, taxonomic notes, hosts, distribution, Florida records and discussion. Wings are figured for 56 species and male genitalia of 49 species are illustrated. Maps showing Florida distribution are provided for all species.

INTRODUCTION

The family Tephritidae is moderately large, with more than 4,000 species distributed throughout the temperate, subtropical, and tropical areas of the world. In America, north of Mexico, there are approximately 275 described species. In Florida, there are 25 genera and 56 species of tephritids represented by the 5 subfamilies: Dacinae, Oedaspinae, Terelliinae, Tephritinae, and Trypetinae.

Many fruit flies are economically important, causing tremendous losses each year to agriculture through their attack on various fruit, nut, and vegetable crops. Other species breed in flower heads, especially of composites, where they feed on the developing seeds, while others mine the stems or form galls on the stem and roots.

An extensive literature on the biology of the control of certain species has been accumulated over the past 100 years because of their economic importance. Much biological and host data on Florida tephritids is available from literature reports, rearing records, and collecting data. Additional collecting and rearing, as well as ecological studies are needed before biological information on most species will be reasonably complete.

In spite of the widespread interest of these highly ornamented flies and the widely scattered description of Florida tephritids, no monographic study of the family has been done for Florida fruit flies. Numerous generic revision during the past 25 years have clarified many of the problems, but much remains to be done. The purpose of this work is to provide workers with a key and descriptions to Florida fruit flies as well as to bring together host information and distribution records for each species. I hope this study will bring the taxonomy of this family up to date for Florida and will stimulate further research on Florida fruit flies to fill some of the gaps in our present knowledge.

GENERAL MORPHOLOGY AND TERMINOLOGY

Detailed accounts of tephritid morphology are provided by Benjamin (1934), Foote and Blanc (1963), Bush (1966), and Novak (1974). This brief discussion focuses on the terminology used in the taxonomic studies of fruit flies.

Head (Fig. 1, 2). The frons (FR) lies between the eyes (E) and extends from the vertex to the lunule (LU). The frons usually is pollinose and bears the upper and lower fronto-orbital bristles. The upper fronto-orbital bristles (UFO) usually consist of 2 pairs, but 1 or 3 pairs may be present. Two or 3 pairs of lower fronto-orbital bristles (LFO) usually are present, but may vary from 1-5 pairs. The lunule extends from the base of the frons to the antennal base.

Below the frons is the facial region (F), which extends from the antennae to the anterior oral margin. The gena (GN) extends vertically from the oral margin to the bottom of the compound eyes. Directly below the compound eyes are the genal bristles (G). The anterolateral margin of the oral opening and post genae (PG) occasionally is heavily setosed. The postocular bristles (POC) are always present and may be light or dark, slender, or robust, and blunt or sharp tipped.

The antennae are 3 segmented. The 3rd antennal segment (3AS) bears the arista (A) which may be varicolored. The 3rd segment is rounded especially, but sometimes has a distinct apicodoral point.

The proboscis is composed of the rostrum and labellum (L). In Genus, Dioxyna, the labellum is slender and attached by its anterior end to the rostrum, forming a geniculate mouthpart.

Thorax. (Fig. 4). The coloration and thoracic pattern are usually useful for generic and species separation. The basic color of the thorax is black, brown, or yellow pollinose. The mesonotum is interrupted by an incomplete transverse suture (TS). The chaetotaxy of the mesonotum is of generic significance. The relative position of the dorsocentral (DC) and acrostichal bristles (ACR) to the suture and supra-alars (ASA) are of great value in identification. All species of Florida tephritids usually have the following bristles present: 1 pair of humeral (H), 1 pair of presutural (PS), 1 pair of intraalars (IAL), 1 pair of acrostichals (ACR), 1 pair of dorsocentrals (DC), 2 pairs of notopleurals (N), and 1-2 pairs of scutellar bristles (SC). The scutellum can be distinctly enlarged or swollen, shining dark brown or black, and the postscutellum and metanotum sometimes can bear color patterns of importance. Chaetotaxy of the legs is less significant except for the minute preapical setae on the venter of hind tibia of Neaspilota, and swollen femur in males of Euaresta. The coloration of femur may be important in identification.

The wings bear significant taxonomic characters and are extensively used for identification. Color pattern and its relation to the veins are useful for species separation. The terminology used by Foote and Blanc (1963) is used for the wing veins and cells (Fig. 3). Among venation characters used are: the presence or absence of setae on the node and vein R 4+5, position of vein r-m in relation to the stigma, the distance along vein M 1+2 separating vein r-m and m, and the presence or absence of a bulla in cell R5.

Abdomen (Fig. 5). The abdomen has 5 visible segments. The terga usually are a single color or are ornamented with a color pattern usually of generic or specific significance as in Acidogona and Xanthaciura. Genitalic characters often are useful. The female ovipositor (Fig. 6) is long and simple and consists of the ovipositor sheath (OVS), the basal sheath (BS), raspers (r), the distal sheath (DS), and the piercer. The tip of the ovipositor has significant taxonomic characters for species separation, especially in the genus Anastrepha. The tip may be short and broad, with many serrations, or long and tapering with larger rounded serrations. The male genitalia (Fig. 7) are either small and compact or large and robust. The epandrium (EP) may be highly arched or truncate; the chaetotaxy of the dorsum is of generic and specific significance. Surstyli (SS) may be elongate or blunt with the inner edges smooth or serrated. The proctiger (PRG) lobe varies in size and shape and bears setae scattered over its entire surface. The

prenisetae (PRS) are a pair of dark tooth-like projections on the inner margins of the surstyli. The ejaculatory apodeme may be fan-shaped or spatulate depending on the species.

Eggs. The eggs are generally white and may be elongated with a long tapering stalk as in the eggs of Toxotrypana curvicauda Gerstaecker and Paracantha culta (Wiedemann); others may be elliptical; the chorion may be smooth or with reticulation and sculpturing; some are without such characters. Characters of the eggs rarely have been used in identification of fruit flies, because not much is known about their morphology. In the rearing and collecting work, workers seldom come across the egg or actually look for eggs. More easily accessible taxonomic characters of adults had larvae are available and are extensively used in fruit fly taxonomy. Brief descriptions of the eggs of several species of tephritids can be found in Knab and Yothers (1914), Emmart (1933), Benjamin (1934), Tauber and Toschi (1965a), and Weems (1965, 1969).

Larva (Fig. 8). The larvae can be divided into 2 morphological groups; 1 group has a shortened barrel-shaped body which is typical of the gall makers and some species that breed in composite flower-heads. Most species are muscidiiform (Fig. 8), the body gradually tapering from a bluntly broad posterior end to a narrow head that possesses a pair of mouth hooks (MH). Full grown larvae are 3-15 mm long, white to light yellow. The exoskeleton, usually is smooth, but may be wrinkled in some species. Occasionally dark markings may be seen on the body which are of generic

and specific significance. Microscopic spines may be present on the dorsum of at least some of the segments. Band of spinules always present ventrally on every segment, presumably is an aid in locomotion. The non-sclerotized head bears a pair of black retractible mouth hooks, cephalopharyngeal skeleton, and sensory organs. These structures provide diagnostic characters for separating genera and closely related species. The anterior spiracles (ASP) are a paired organ usually located dorsolaterally on the prothorax, each bearing distally a number of digits which varies from 3 in Neaspilota achilleae Johnson to as many as 53 in Strauzia longipennis (Wiedemann). The caudal segment may be smooth or tuberculate; posterior spiracles occur on the dorsal half of the segment. Greene (1929), Benjamir (1934), and Phillips (1946) discussed in detail the larval characters of some of the Florida tephritids. The most recent works on the immatures of some tephritid species are those of Pruitt (1953), Bush (1962, 1965), and Steyskal (1975).

Pupa (Fig. 9) The Puparium is of the usual stout cylindrical form, with rounded ends ranging from straw colored to black, except that of Acinia fucata (Fabricius), which is bean-shaped, glossy rufous, brown dorsally and laterally. Length varies from 2-13 mm. Segmental sutures are clearly defined in most species; others are indistinct and poorly defined, like those of Euaestoides abstersus (Loew) and Tephritis subpura (Johnson). Anterior spiracles usually are like those of the larvae, but more likely to be highly pigmented

in some species, the caudal end often blackened. The posterior spiracles usually are located on spiracular plate. Greene (1929) and Benjamin (1934) briefly described the pupal characters of some tephritid species.

Figure 1-2. Chaetotaxy and areas of the head; Fig; 1, lateral view. Fig. 2. Front view; A: Arista; E: Eyes; F: Face; FC: Facial carina; FR: frons; G. Genal bristles; GN: Gena; INV: Intravertic bristles; IV: Innervertical bristle; L: Labella; LFO: Lower fronto-orbital bristles; LU: Lunule; OC: Ocellar bristles; OV: Outervertical bristles; PA: Parafacial; PO: Parafrontal; PG: Postgena; POC: Postocular bristles; UFO: Upper fronto-orbital bristles; IAS: 1st antennal segment; 2AS: 2nd antennal segment; 3AS: 3rd antennal segment;

Figure 3: Wing showing cells and venation.

Figure 4. Dorsal view, chaetotaxy and areas of thorax: ACR: Acrostichal bristle; ASA: Anterior supra-alar bristle; DC: Dorsocentral bristle; H: Humeral bristle; IAR: Intra-alar bristle; N: Notopleural bristle; PAL: Postalar bristles; SCS: Scutoscutellar suture; SCT: Scutellum; TS: Transverse suture.

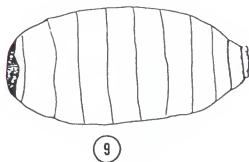
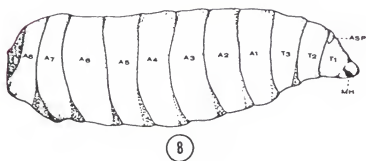
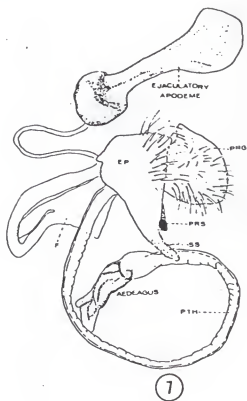
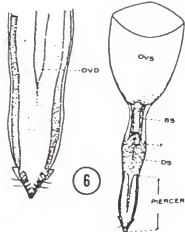
Figure 5. Dorsal view of abdomen showing segmentation and position of bristles; OVS: Ovipositor sheath; T: Tergum.

Figure 6. Female ovipositor; BS: Basal sheath; DS: Distal sheath; OVD: Oviduct; OVS: Ovipositor sheath; r: rasper.

Figure 7. Male genitalia; DP: Epandrium; F: Futella PRG: Proctiger; PRS: Pronsisetae; PTH: Phallotheca; SS: Surstylus.

Figure 8. Typical larva; A: Abdominal segment; ASP: Anterior spiracle; MH: Mouth hook; T: Thoracic segment.

Figure 9. Typical pupa.



BIOLOGY

As far as is known, all fruit flies deposit their eggs directly into living healthy plant tissues. Eggs may be inserted to a depth of 1/4 inch (6.4 mm) in soft fruits or just beneath the skin in others; eggs of leaf-mining tephritids are inserted from the ventral surface into the parenchyma of leaf margin like those of Euleia fratria (Loew) and E. heraclei (Linnaeus). Females of some species may successively use the same ovipuncture or ovipunctures made by others to deposit their eggs. Up to 8 eggs/puncture have been observed, but 3-4 eggs are more common. Normally the larva emerges within a few days and begins to feed and burrow into the pulp of the hosts; some excavate galleries within the parenchyma of the leaf; others mine down to the ovaries, receptacles and corolla. Damage to the commercial fruits and vegetables can be substantial. Larvae of those that breed primarily on composites feed on the developing seeds and cause serious losses of viability. The infested fruits or vegetables ripen prematurely, deteriorate and drop to the ground. Composite feeding tephritids tend to pupate within the flower heads at the feeding site, such as Trupanea actinobola (Loew), Acidogona melanura (Loew) and Acinia fucata (Fabricius). Duration of stages

and host preference varies greatly with species. Christenson and Foote (1960) summarized the life history of several species of fruit flies. A few days to a week or more are required for attainment of sexual maturity, after the adult emerges, mating occurs and a new cycle is begun. Bush (1966) reported that adults of Rhagoletis live up to 70 days in the laboratory, but 20-30 under natural conditions. Adult longevity of Euleia fratria exceeds 13 weeks (Tauber and Toschi, 1965a).

Bateman (1972) divided the family into 2 major groups based on physiological and ecological characters. Many species that inhabit tropical and subtropical regions are multivoltine and have no obvious diapause. Several species endemic to Florida seem to fall into this group. The univoltine group inhabiting the more temperate region have winter diapause. All holarctic species of Rhagoletis essentially belong to this group (Bush, 1966). The range of environments to which these forms are exposed is extremely broad; no single environmental component determines their abundance. Bateman (1972) discussed in detail the principal components of the life system of fruit flies.

Little is known about the factors controlling diapause in fruit flies; these characteristics are of considerably selective advantage as they insure supply of adults for several seasons. Most temperate species of fruit flies overwinter as diapausing pupae. Usually diapause must be broken by a period of low

temperature, some individuals require as many as 4 successive chillings before completing development (Boyce, 1934).

Many species of fruit flies are attacked by a complex of native larval parasites. The majority of these parasites exist at quite low densities even in the native hosts. Two hymenopterous parasites, Heteroschema punctata (Ashmead) and Colotrechnus ignotus Burks, were reared from the immature stages of T. actinobola by Stegmaier (1968b). Marsh (1970) described a new species of parasite attacking larval of Anastrepha suspensa (Loew) and A. interrupta Stone from Florida. Baranowski and Swanson (1970) introduced 45 females and 26 males of Parachasma cereus (Gahan) a parasite of A. suspensa in Homestead and found that 2 1/2 months after release, 3.4-25% of pupae from fruits about 0.4 miles (0.64 Km) from the point of release were parasitized. Up to 43% of pupae from tropical almond were parasitized by these parasites. The effectiveness of some biological control efforts in fruit fly control has been evaluated by Clausen (1956).

Courtship and mating behavior in Tephritidae have been extensively studied by many authors and may be a complex process involving a variety of cues and sequences (Prokopy and Bush, 1973; Stoltzfus and Foot, 1965; and Tauber and Tauber, 1967). Prokopy et al. (1971) divided the mating behavior of Rhagoletis pomonella Walsh into 2 main processes and revealed that the site of male: female assembly for mating was exclusively on the fruits of the larval host plant. Zonosemata electa (Say) adults have been

observed initiating copulation on the fruits of their respective larval host plants (Peterson, 1923 and Burdett, 1935). The elements and the sequence of courtship displays of male and female E. fratria were discussed by Tauber and Toschi (1965a). Courtship behavior of A. suspensa was described by Nation (1972). Knowledge of this behavior is important not only because of its potential usefulness toward developing new, non-insecticide approaches to population management, but also because of its relevance to the possibility of rapid sympatric host formation and speciation especially with the Rhagoletis pomonella species complex (Bush 1966, 1969a, b). Sound production, the use of froth masses, body movements, and elaborate wing displays coupled with distinctive wing patterns are known to be important components in courtship (Stoltzfus and Foote, 1965). Bateman (1972) considers smell and hearing as the 2 most important sensory stimuli for mating response in Tephritidae.

Tephritidae are well known as fruit flies, however, all parts of plants are attacked including flower heads, leaves, stems, and roots. Of the 56 species recorded in Florida, at least 44 species have host records or probable host associations. Foote and Blanc (1963) compiled a list of host plants of California Tephritidae. An annotated host catalog of the fruit flies of North America was compiled by Wasbauer (1972). The list at the end of this section includes all known host plants of Florida Tephritidae arranged according to host plant families and fruit fly species.

The extent of those specificity is well studied for Rhagoletis species. Bush (1966) presented evidence that indicates that under both laboratory and field conditions, many species of Rhagoletis are capable of ovipositing in a wide range of fruits which are not their normal hosts.

The host plants of Florida Tephritidae are listed on the following pages.

Anacardiceae

Mangifera indica L.

Anastrepha obliqua (Macquart)

Anastrepha suspensa (Loew)

Toxotrypana curvicauda Gerstaecker

Spondias mombin L.

Anastrepha obliqua (Macquart)

Spondias purpurea L.

Anastrepha obliqua (Macquart)

Anastrepha suspensa (Loew)

Spondias sp.

Anastrepha obliqua (Macquart)

Annonaceae

Annona reticulata L.

Anastrepha suspensa (Loew)

Annona squamosa L.

Anastrepha suspensa (Loew)

Apocynaceae

Carissa grandiflora

(E. H. Mey) A. DC.

Anastrepha suspensa (Loew)

Aquifoliaceae

Ilex caroliniana (Walt.)

Trelease

Myoleja limata (Coquillett)

Ilex cassine L.

Myoleja limata (Coquillett)

<u>Ilex coriacea</u> (Pursh) Chapm.	<u>Myoleja limata</u> (Coquillett)
<u>Ilex decidua</u> Walt.	<u>Myoleja limata</u> (Coquillett)
<u>Ilex glabra</u> (L.) Gray	<u>Myoleja limata</u> (Coquillett)
<u>Ilex opaca</u> Ait.	<u>Myoleja limata</u> (Coquillett)
<u>Ilex vomitoria</u> Ait.	<u>Myoleja limata</u> (Coquillett)

Araliaceae

<u>Trevesia palmata</u> (Roxb.) Vis.	<u>Anastrepha suspensa</u> (Loew)
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Caricaceae

<u>Carica papaya</u> L.	<u>Anastrepha suspensa</u> (Loew)
	<u>Toxotrypana curvicauda</u> Gerstaecker

Combretaceae

<u>Terminalia catappa</u> L.	<u>Anastrepha suspensa</u> (Loew)
<u>Terminalia muelleri</u> Benth.	<u>Anastrepha suspensa</u> (Loew)

Compositae

<u>Ageratum houstonianum</u> Mill.	<u>Xanthaciura tetraspina</u> (Phillips)
<u>Ageratum littorale</u> Gray	<u>Trupanea agerata</u> Benjamin
	<u>Xanthaciura connexionis</u> Benjamin
<u>Ageratum</u> sp.	<u>Xanthaciura insecta</u> (Loew)
<u>Ambrosia artemisiifolia</u> L.	<u>Euaresta bella</u> (Loew)
<u>Ambrosia</u> sp.	<u>Euarestoides abstersus</u> (Loew)
<u>Aster adnatus</u> Nutt.	<u>Trupanea actinobola</u> (Loew)
<u>Aster carolinianus</u> Walt.	<u>Neaspilota achilleae</u> Johnson
	<u>Trupanea actinobola</u> (Loew)
<u>Aster concolor</u> L.	<u>Neaspilota achilleae</u> Johnson
<u>Aster dumosus</u> L.	<u>Trupanea actinobola</u> (Loew)

Aster dumosus L. var.

subulaefolius T & G

Aster elliotii T & G

Aster tortifolius Michx.

Baccharis glomeruliflora

Pers.

Balduina angustifolia

(Pursh) Robinson

Bidens bipinnata L.

Bidens coronata (L.) Britt

Bidens laevis (L.) BSP

Bidens mitis (Michx) Sherff.

Bidens pilosa L.

Bidens pilosa L. var.

radiata Schultz. Bip.

Trupanea actinobola (Loew)

Trupanea actinobola (Loew)

Neaspiolita achilleae Johnson

Neaspolita punctistigma Benjamin

Tephritis subpura (Johnson)

Dioxyna picciola (Bigot)

Trupanea actinobola (Loew)

Xanthaciura tetraspina (Phillips)

Dioxyna picciola (Bigot)

Dioxyna thomae (Curran)

Xanthaciura insecta (Loew)

Xanthaciura insecta (Loew)

Dioxyna picciola (Bigot)

Xanthaciura insecta (Loew)

Xanthaciura tetraspina (Phillips)

Dioxyna picciola (Bigot)

Xanthaciura insecta (Loew)

Dioxyna picciola (Bigot)

Euaresta bella (Loew)

Xanthaciura insecta (Loew)

Xanthaciura tetraspina (Phillips)

Dioxyna picciola (Bigot)

	<u>Xanthaciura insecta</u> (Loew)
<u>Borrichia frutescens</u> (L.) DC.	<u>Paracantha forficula</u> Benjamin
	<u>Xanthaciura insecta</u> (Loew)
<u>Carduus carolinianus</u> Walt.	<u>Dioxyna picciola</u> (Bigot)
	<u>Paracantha culta</u> (Wiedemann)
<u>Carduus nuttallii</u> (DC.)	
Pollard	<u>Paracantha culta</u> (Wiedemann)
<u>Carduus spinosissimus</u> Walt.	<u>Paracantha culta</u> (Wiedemann)
<u>Carduus</u> sp.	<u>Neaspilota dolosa</u> Benjamin
	<u>Paracantha culta</u> (Wiedemann)
<u>Chrysopsis graminifolia</u>	
(Michx.) Ell.	<u>Neaspilota achilleae</u> Johnson
	<u>Neaspilota punctistigma</u> Benjamin
	<u>Trupanea mevarna</u> (Walker)
<u>Conyza canadensis</u> (L.)	
Conquist	<u>Procecidochares australis</u> Aldrich
<u>Coreopsis leavenworthii</u> T & G	<u>Dioxyna picciola</u> (Bigot)
<u>Coreopsis nudata</u> Nutt.	<u>Dioxyna picciola</u> (Bigot)
<u>Coreopsis tinctoria</u> Nutt.	<u>Dioxyna picciola</u> (Bigot)
<u>Coreopsis tripteris</u> L.	<u>Dioxyna picciola</u> (Bigot)
<u>Coreopsis</u> sp.	<u>Trupanea actinobola</u> (Loew)
<u>Cosmos</u> sp.	<u>Dioxyna picciola</u> (Bigot)
<u>Eclipta alba</u> (L.) Hassk.	<u>Trupanea eclipta</u> Benjamin
<u>Erigeron quercifolius</u> Lam.	<u>Neaspilota dolosa</u> Benjamin
	<u>Trupanea actinobola</u> (Loew)
<u>Erigeron strigosus</u> Muhl.	
ex Willd.	<u>Neaspilota achilleae</u> Johnson

- Erigeron vernus (L.)
Torr. & A. Gray
- Erigeron Sp.
- Eupatroium coelestinum L.
- Gnaphalium obtusifolium L.
- Haplopappus divaricatus
(Nutt.) Gray
- Haplopappus phyllocephallus
DC. var. megacephallus
(Nash) Waterfall
- Helenium flexuosum Raf.
- Heterotheca hyssopifolia
(Nutt.) R. W. Long
- Heterotheca mariana (L.)
Shiners
- Heterotheca nervosa (Willd.)
Shinners var.
microcephala (Small)
Shiners
- Neaspilota dolosa Benjamin
- Neaspilota achilleae Johnson
- Neaspilota dolosa Benjamin
- Neaspilota punctistigma Benjamin
- Trupanea actinobola (Loew)
- Trupanea actinobola (Loew)
- Xanthaciura connexionis Benjamin
- Xanthaciura tetraspina (Phillips)
- Trupanea dacetoptera Phillips
- Trupanea actinobola (Loew)
- Neaspilota dolosa Benjamin
- Dioxyna picciola (Bigot)
- Neaspilota punctistigma Benjamin
- Neaspilota punctistigma Benjamin
- Neaspilota achilleae Johnson

Heterotheca oligantha

(Chapm.) Harms.

Heterotheca subaxillaries

(Lam.) Britt. & Rusby

Heterotheca trichophylla

(Nutt.) Shinnars

Heterotheca sp.Hieracium argyraeum SmallHieracium gronovii L.Hieracium scabrum Michx.Hieracium sp.Neaspilota punctistigma BenjaminTrupanea dacetoptera PhillipsTrupanea mevarna (Walker)Neaspilota achilleae JohnsonTrupanea mevarna (Walker)Neaspilota dolosa BenjaminProcecidochares australis AldrichXanthaciura insecta (Loew)Neaspilota punctistigma BenjaminPeronyma sarcinata (Loew)Neaspilota punctistigma BenjaminTrupanea actinobola (Loew)Trupanea mevarna (Walker)Acidogona melanura (Loew)Neaspilota achilleae JohnsonAcidogona melanura (Loew)Neaspilota achilleae JohnsonAcidogona melanura (Loew)Neaspilota achilleae JohnsonAcidogona melanura (Loew)Trupanea actinobola (Loew)

Melanthera aspera Jacq. var.

<u>grabiuscla</u> (Kuntze) Parks	<u>Dyseuaresta mexicana</u> (Wiedemann)
<u>Melanthera nivea</u> (L.) Small	<u>Dyseuaresta mexicana</u> (Wiedemann)
<u>Melanthera parviflora</u> Small	<u>Dyseuaresta mexicana</u> (Wiedemann)
<u>Melanthera</u> sp.	<u>Dyseuaresta mexicana</u> (Wiedemann)
<u>Mikania scandens</u> (L.) Willd.	<u>Xanthaciura connexionis</u> Benjamin
<u>Pluchea foetida</u> (L.) DC.	<u>Acinia fucata</u> (Fabricius)
	<u>Neaspilota punctistigma</u> Benjamin
<u>Pluchea imbricata</u> (Kearney)	
Nash	<u>Acinia fucata</u> (Fabricius)
	<u>Neaspilota punctistigma</u> Benjamin
<u>Pluchea odorata</u> (L.) Cass.	<u>Acinia fucata</u> (Fabricius)
<u>Pluchea purpurescens</u> (Sw.) DC.	<u>Acinia fucata</u> (Fabricius)
<u>Pluchea rosea</u> P. K. Godfrey	<u>Acinia fucata</u> (Fabricius)
<u>Pluchea</u> sp.	<u>Acinia fucata</u> (Fabricius)
<u>Solidago caesia</u> L.	<u>Trupanea actinobola</u> (Loew)
<u>Solidago chapmanii</u> T & G	<u>Eurosta donysa</u> (Walker)
	<u>Trupanea actinobola</u> (Loew)
<u>Solidago fistulosa</u> Mill.	<u>Eurosta comma</u> (Wiedemann)
	<u>Eurosta floridensis</u> Foote
<u>Solidago gigantea</u> Ait.	<u>Trupanea actinobola</u> (Loew)
<u>Solidago stricta</u> Ait.	<u>Procecidochares polita</u> (Loew)
	<u>Trupanea actinobola</u> (Loew)
<u>Solidago</u> sp.	<u>Eurosta comma</u> (Wiedemann)
	<u>Eurosta donysa</u> (Walker)
	<u>Eurosta floridensis</u> Foote
	<u>Procecidocharea pilota</u> (Loew)

	<u>Trypanea actinobola</u> (Loew)
<u>Tagetes recta</u> L.	<u>Dioxyna picciola</u> (Bigot)
<u>Trilisa paniculata</u> (Walt.)	
es J. F. Gmel. Cass	<u>Euarestoides abstersus</u> (Loew)
<u>Vernonia blodgettii</u> Small	<u>Neaspilota floridana</u> Rohani n. sp.
	<u>Tomoplagia obliqua</u> (Say)
<u>Vernonia gigantea</u> (Walt.) Trel	<u>Neaspilota floridana</u> Rohani n. sp.
	<u>Tomoplagia obliqua</u> (Say)
<u>Vernonia scaberrima</u> Nutt.	<u>Neaspilota floridana</u> Rohani n. sp.
	<u>Tomoplagia obliqua</u> (Say)
<u>Vernonia</u> sp.	<u>Tomoplagia obliqua</u> (Say)
Cornaceae	
<u>Cornus florida</u> L.	<u>Anastrepha suspensa</u> (Loew)
Cucurbitaceae	
<u>Momordica balsamina</u> L.	<u>Anastrepha suspensa</u> (Loew)
Ebanaceae	
<u>Diospyros virginiana</u> L.	<u>Anastrepha suspensa</u> (Loew)
<u>Diospyros</u> sp.	<u>Anastrepha suspensa</u> (Loew)
Ericaceae	
<u>Vaccinium arboreum</u> Marsh	<u>Rhagoletis mendax</u> Curran
<u>Vaccinium formosum</u> Andr.	<u>Rhagoletis mendax</u> Curran
Euphorbiaceae	
<u>Bischofes Javanica</u> Blume	<u>Anastrepha suspensa</u> (Loew)
Flacourtiaceae	
<u>Dovyalis hebecarpa</u> (G. Gardn.)	
Warb.	<u>Anastrepha suspensa</u> (Loew)

Flacourtia indicaAnastrepha suspensa

Guttiferae

Garcinia livingstonei

T. Anderson

Anastrepha suspensa (Loew)

Lauraceae

Persea americana MillAnastrepha suspensa (Loew)

Malpighiaceae

Malpighia glabra L.Anastrepha suspensa (Loew)

Myrtaceae

Eugenia brasiliensis Lam.Anastrepha suspensa (Loew)Eugenia ligustrina (Swartz)

Willd.

Anastrepha suspensa (Loew)Eugenia luschnathiana Klotzsch

ex. O. Berg.

Anastrepha suspensa (Loew)Eugenia uniflora L.Anastrepha suspensa (Loew)Myrciaria cauliflora (DEC.)

O. Berg.

Anastrepha suspensaPimanta dioica (L.) MerrillAnastrepha suspensa (Loew)Pseudanannomis umbellulifera

Kausel

Anastrepha suspensa (Loew)Psidium littorale var.longipes (O. Berg.)

Fosb.

Anastrepha suspensa (Loew)Ceratitis capitata (Wiedemann)Psidium friedrichsthalianum

(O. Berg.) Niewdenzu

Anastrepha suspensa (Loew)

Psidium guajava L.Anastrepha suspensa (Loew)Anastrepha ocrexia (Walker)Toxotrypana curvicauda GerstaeckerPsidium sp.Anastrepha suspensa (Loew)Syzygium jambos (L.) Alston Anastrepha obliqua (Macquart)Anastrepha suspensa (Loew)Ceratitis capitata (Wiedemann)Syzygium samarangense (Blume)

Merrill & L. M. Perry

Anastrepha suspensa (Loew)

Moraceae

Ficus carica L.Anastrepha suspensa (Loew)

Olacaceae

Schoepfia schreberi

J. F. Gmel.

Anastrepha interrupta Stone

Oleaceae

Chionanthus virginicus L. Rhagoletis chionanthi BushOsmanthus americanus (L.)

Gray

Rhagoletis osmanthi Bush

Oxalidaceae

Averrhoa carambola L.Anastrepha suspensa (Loew)

Punicaceae

Punica granatum L.Anastrepha suspensa (Loew)

Rosaceae

Aronia arbutifolia (L.)

Pers.

Rhagoletis pomonella (Walsh)Crataegus maloides Sarg.Rhagoletis pomonella (Walsh)

<u>Crataegus</u> sp.	<u>Rhagoletis pomonella</u> (Walsh)
<u>Eriobotrya japonica</u> (Thub.) Lindl.	<u>Anastrepha suspensa</u> (Loew)
<u>Prunus americana</u> Marsh.	<u>Anastrepha suspensa</u> (Loew)
<u>Prunus persica</u> (L.) Batsch	<u>Anastrepha suspensa</u> (Loew)
<u>Prunus serotina</u> Ehrh.	<u>Rhagoletis cingulata</u> (Loew)
<u>Prunus umbellata</u> Ell.	<u>Rhagoletis pomonella</u> (Walsh)
<u>Prunus</u> sp.	<u>Anastrepha suspensa</u> (Loew)
	<u>Rhagoletis pomonella</u> (Walsh)
<u>Pyrus communis</u> L.	<u>Anastrepha suspensa</u> (Loew)
<u>Pyrus X lecontei</u> Rehd.	<u>Anastrepha suspensa</u> (Loew)
<u>Rubus</u> sp.	<u>Anastrepha suspensa</u> (Loew)
Rutaceae	
<u>Casimiora edulis</u> Llave	<u>Acinia picturata</u> (Snow)
	<u>Anastrepha suspensa</u> (Loew)
	<u>Xanthaciura insecta</u> (Loew)
	<u>Tomoplagia obliqua</u> (Say)
<u>Citrofortunella mitis</u> (Blanco) J.	<u>Anastrepha suspensa</u> (Loew)
	<u>Certitis capitata</u> (Wiedemann)
<u>Citrus aurantium</u> L.	<u>Anastrepha suspensa</u> (Loew)
<u>Citrus X paradisi</u> Macfady	<u>Anastrepha suspensa</u> (Loew)
<u>Citrus sinensis</u> (L.) Osbeck	<u>Anastrepha suspensa</u> (Loew)
<u>Citrus X nobilis</u> Lour.	
"Temple"	<u>Anastrepha suspensa</u> (Loew)

<u>Citrus</u> sp.	<u>Anastrepha</u> <u>supensa</u> (Loew)
<u>Clausena</u> <u>lansium</u> (Lour.)	
Skeels	<u>Anastrepha</u> <u>suspensa</u> (Loew)
<u>Fortunella</u> <u>margarita</u> (Lour.)	
Swingle	<u>Anastrepha</u> <u>suspensa</u> (Loew)
<u>Fortunella</u> Sp.	<u>Anastrepha</u> <u>suspensa</u> (Loew)
<u>Murraya</u> <u>paniculata</u> (L.)	
Jack	<u>Anastrepha</u> <u>suspensa</u> (Loew)
<u>Severinia</u> <u>buxifolia</u>	
(Poir.) Ten	<u>Anastrepha</u> <u>suspensa</u> (Loew)
<u>Triphasia</u> <u>trifolia</u>	
(Burm. f.) P. Wils.	<u>Anastrepha</u> <u>suspensa</u> (Loew)
Sapindaceae	
<u>Litchi</u> <u>chinensis</u> Sonn.	<u>Anastrepha</u> <u>suspensa</u> (Loew)
Sapotaceae	
<u>Chrysophyllum</u> <u>oliviforme</u> L.	<u>Anastrepha</u> <u>suspensa</u> (Loew)
<u>Manilkara</u> <u>bahamensis</u> (Bak.)	
Lam & Meeus	<u>Anastrepha</u> <u>nigrifascia</u> Stone
<u>Manilkara</u> <u>zapota</u> (L.)	
Van Royen	<u>Anastrepha</u> <u>nigrifascia</u> Stone
	<u>Anastrepha</u> <u>ocresia</u> (Walker)
	<u>Anastrepha</u> <u>suspensa</u> (Loew)
<u>Pouteria</u> <u>campechiana</u> (HBK)	
Baehni	<u>Anastrepha</u> <u>suspensa</u> (Loew)
<u>Synsepalum</u> <u>dulcificum</u>	
(Schumch. & Thonn)	
<u>Daniell</u> ex X. Bell.	<u>Anastrepha</u> <u>suspensa</u> (Loew)

Solanaceae

Capsicum frutescens L.Anastrepha suspensa (Loew)Lycopersicon esculentum

Mill

Anastrepha suspensa (Loew)Zonosemata electa (Say)Solanum aculeatissimum

Jacq.

Zonosemata electa (say)Solanum carolinense L.Zonosemata electa (Say)

Hosts by Fruit Fly SpeciesAcidogona melanura (Loew)Hieracium argyraeum SmallHieracium grunovii (L.)Hieracium scabrum Michx.Hieracium sp.Acinia fucata (Fabricius)Pluchea foetida (L.) DCPluchea imbricata (Kearney) NashPluchea odorata (L.) Cass.Pluchea purpurescens (Sw.) DCPluchea rosea GodfreyPluchea spAcrotaenia testudinea (Loew)

No host information

Anastrepha edentata Stone

No host information

Anastrepha interrupta StoneSchoepfia schreberi J. F. GmelAnastrepha nigrifascia StoneManilkara bahamensis

(Bak.) Lam. & Meeuse

Manilkara zapota (L.) von RoyenAnastrepha obliqua (Macquart)Mangifera indica L.

Psidium guajava L.

Spondias mombin L.

Spondias purpurea L.

Syzygium jambos (L.) Alston

Anastrepha ocreata (Walker)

Manilkara zapota (L.) van Royen

Psidium guajava L.

Anastrepha suspensa (Loew)

Annona reticulata L.

Annona squamosa L.

Averrhoa carambola L.

Bischofia javanica Blume

Capsicum frutescens L.

Carica papaya L.

Carissa grandiflora (E. H. Mey.) A. DC.

Chrysophyllum oliviforme L.

Citrofortunella mitis (Blanco) J. Irgam & H. E. Moore

Citrus aurantium L.

Citrus X paradisi Macfady

Citrus sinensis (L.) Osbeck

Citrus sp.

Clausena lansium (Lour.) Skeels

Diospyros virginiana L.

Diospyros sp.

Dovyalis hebecarpa (G. Gardn.) Warb.

Eriobotrya japonica (Thunb.) Lindl.

Eugenia brasiliensis Lam.

Eugenia ligustrina (Swartz) Willd.

Eugenia luschnathiana Klotzschex O. Berg.

Eugenia uniflora L.

Flacourtia indica (Burm. f.) Merrill

Fortunella margarita (Lour.) Swingle.

Fortunella sp.

Garcinia livingstonei T. Anderson

Litchi chinensis Sonn.

Lycopersicon esculentum Mill.

Malpighia glabra L.

Mangifera indica L.

Manilkara zapota (L.) van Royen

Momordica balsamina L.

Murraya paniculata (L.) Jack

Myrciara cauliflora (DC.) O. Berg.

Persea americana Mill.

Pimento dioica (L.) Merrill

Pouteria campechiana (HBK) Baehni

Prunus americana Marsh

Prunus persica (L.) Batsch.

prunus sp.

Pseudanamonis umbellulifera Kausel

Psidium littorale var. longipes (O. Berg.) Fosb.

Psidium freidrichsthalianum (O. Berg.) Niewdenzu

Psidium guava L.

Psidium sp.

Punica granatum L.

Pyrus communis L.

Pyrus Xlecontei Rehd.

Rubus sp.

Severinia buxifolia (Poir.) Ten

Spondias purpurea L.

Synsepalum dulcificum (Schumach. & Thonn.) Daniell ex S. Bell

Syzygium jambos (L.) Alston

Syzygium samarangense (Blume) Merrill & L. M. Perry

Terminalia catappa L.

Terminalia muelleri Benth.

Triphasia trifolia (Burm. f.) P. Wils.

Trevesia palmata (Roxb.) Vis.

Ceratitis capitata (Wiedemann)

Citrofortunella mitis (Blanco) J. Ingram & H. E. Moore

Psidium littorale var. longipes (O. Berg.) Fosb.

Syzygium jamnos (L.) Alston

Dioxya picciola (Bigot)

Balduina angustifolia (Poursh) Robinson

Bidens bipinnata L.

Bidens leavis (L.) BSP

Bidens mitis (Michx.) Sherff

Bidens pilosa L.

Bidens pilosa L. var. radiata Schultz-Bip.

Carduus carolinianus Walt.

Coreopsis leavenworthii T. & G.

Coreopsis nudata Nutt.

Coreopsis tinctoria L.

Coreopsis tripteris L.

Cosmos sp.

Helenium flexuosum Raf.

Tagetes erecta L.

Dioxyna thomae (Curran)

Bidens bipinnata L.

Dyseuaresta mexicana (Wiedemann)

Melanthera aspera Jacq. var. grabiuscula (Kuntze) Parks

Melanthera nivea (L.) Small

Melanthera parviflora Small

Melanthera sp.

Euaresta aequalis (Loew)

No host information

Euaresta bella (Loew)

Ambrosia artemisiifolia L.

Bidens pilosa L.

Euarestoides abstersus (Loew)

Ambrosia sp.

Trilisa paniculata (Walt. ex J. F. Gmel) Cass.

Euleia fratria (Loew)

No host information

Eurosta comma (Wiedemann)

Solidago fistulosa Mill.

Solidago sp.

Eurosta donysa (Walker)

Solidago champmanii T & G

Solidago sp.

Eurosta fenestrata Snow

No host information

Eurosta floridensis Foote

Solidago fistulosa Mill.

Solidago sp

Myoleja limata (Coquillett)

Ilex caroliniana (Walt.) Trelease

Ilex cassine L.

Ilex coriacea (Pursh) Chapm.

Ilex decidua Walt.

Ilex glabra (L.) A. Gray

Ilex opaca Ait.

Ilex vomitoria Ait.

Myoleja nigricornis

No host information

Myoleja rhino Steyskal

No host information

Neaspilota achilleae Johnson

Aster carolinianus Walt.

Aster concolor L.

Aster tortifolius Michx.

Chrysopsis graminifolia (Michx.) Ell.

Erigeron strigosus Muhl. ex Willd.

Erigeron vernus (L.) Torr. & A. Gray

Heterotheca nervosa (Willd.) Shinnervar. microcephala (Small) Shinnervar.

Heterotheca oligantha (Chapm.) Harms.

Hieracium argyracum Small

Hieracium gronovii L.

Hieracium scabrum Michx.

Neaspilota dolosa (Benjamin)

Carduus sp.

Erigeron quercifolius Lam.

Erigeron strigosus Muhl. ex Willd.

Erigeron vernus (L.) Torr. & A. Gray

Haploppapus phyllocephallus DC. var. megacephallus (Nash) Waterfall

Heterotheca subaxillaries (Lam.) Britt. & Rusby

Neaspilota floridana Rhhani n. sp.

Vernonia blodgettii Small

Vernonia gigantea (Walt.) Trel.

Vernonia scaberrima Nutt.

Neaspilota punctistigma Benjamin

Aster tortifolius Michx.

Chrysopsis graminifolia (Michx.) Ell.

Erigeron vernus (L.) Torr. & A. Gray

Heterotheca hyssopifolia (Nutt.) R. W. Long

Heterotheca mariana (L.) Shinnars

Heterotheca nervosa (Wild.) Shinnars var. microcephala

Small Shinnars

Heterotheca trichophylla (Nutt.) Shinnars

Heterotheca sp.

Pluchea foetida (L.) DC.

Pluchea imbricata (Kearney) Nash

Neaspilota vernonia (Loew)

No host information

Paracantha culta (Wiedemann)

Carduus carolinianus Walt.

Carduus nuttallii (DC.) Pollard

Carduus spinosissimus Walt.

Carduus sp.

Paracantha forficula (Coquillett)

Borrichia frutescens (L.) DC.

Peronyma sarcinata (Loew)

Heterotheca trichophylla (Nutt.) Shinnars

Procecidochares atra (Loew)

No host information

Procecidochares australis Aldrich

Conyza canadensis (L.) Conquist

Heterotheca subaxillaries (Lam.) Britt. & Rusby

Procecidochares polita (Loew)

Solidago stricta Ait.

Solidago sp.

Rhagoletis chionanthi Bush

Chionanthus virginicus L.

Rhagoletis cingulata (Loew)

Prunus serotina Ehrh.

Rhagoletis cornivora Bush

Cornus florida L.

Rhagoletis mendax Curran

Vaccinium arboreum Marsh.

Vaccinium formosum Andr.

Rhagoletis osmanthi Bush

Osmanthus americanus (L.) Gray

Rhagoletis pomonella (Walsh)

Aronia arbutifolia (L.) Pers.

Crataegus maloides Sarg.

Crataegus sp.

Prunus angustifolia Marsh.

Prunus umbellata Ell.

Prunus sp.

Stenopa vulnerata (Loew)

No host information

Strauzia longipennis (Wiedemann)

No host information

Tephritis subpura (Johnson)

Baccharis glomeruliflora Pers.

Tomoplagia obliqua (Say)

Vernonia blodgetti Small

Vernonia gigantea (Walt.) Trel.

Vernonia scaberrima Nutt.

Vernonia sp.

Toxotrypana curvicauda Gerstaecker

Carica papaya L.

Mangifera indica L.

Psidium guajava L.

Trupanea actinobola (Loew)

Aster adnatus Nutt.

Aster carolinianus Walt.

Aster dumosus L.

Aster dumosus L. var. subulaefolius T & G

Aster elliottii T & G

Balduina angustifolia (Pursh) Robinson

Coreopsis sp.

Erigeron quercifolius Lam.

Erigeron vernus (L.) Torr. & A. Gray

Erigeron sp.

Haploppapus divaricatus (Nutt.) Gray

Heterotheca sp.

Hieracium sp.

Solidago caesia L.

Solidago chapmanii T & G

Solidago gigantea Ait.

Solidago stricta Ait.

Solidago sp.

Trupanea ageratae Benjamin

Ageratum littorale Gray

Trupanea dacetoptera Phillips

Gnaphalium obtusifolium L.

Heterotheca nervosa (Willd.) Shinnars var. microcephala (Small)

Shinnars

Trupanea eclipa Benjamin

Eclipa alba (L.) Hassk.

Trupanea mevarna (Walker)

Chrysopsis graminifolia (Michx.) Ell

Heterotheca nervosa (Willd.) Shinn. var. microcephala (Small)

Heterotheca oligantha (Chapm.) Harms.

Heterotheca sp.

Xanthaciura chrysur (Thomson)

No host information

Xanthaciura connexionis Benjamin

Ageratum littorale Gray

Eupatorium coelestinum L.

Mikania scandens (L.) Willd.

Xanthaciura insecta (Loew)

Ageratum sp.

Bidens bipinnata L.

Bidens coranata (L.) Britt.

Bidens laevis (L.)

Bidens mitis (Michx.) Sherff

Bidens pilosa L.

Bidens pilosa var. radiata Schultz-Bip.

Borrchia frutescens (L.) DC.

Heterotheca subaxillaries (Lam.) Birtt & Rusby

Xanthaciura tetraspina (Phillips)

Ageratum houstonianum Mill.

Balduina angustifolia (Pursh) Robinson

Bidens laevis (L.) BSP

Bidens pilosa L.

Eupatorium coelestinum L.

Zonosemata electa (Say)

Lycopersicon esculentum Mill.

Solanum aculeatissimum Jacq.

Solanum carolinense L.

ECONOMIC IMPORTANCE

The family Tephritidae contains some of the most destructive fruit flies including Carribean, Mediterranean, Melon, and Oriental fruit flies and thus constitutes one of the most important families of Diptera. The larvae of many species live and feed on the fleshy part of various fruits, nuts, and vegetables and cause tremendous loss each year to agricultures worldwide. At least 13 species of the 275 known Tephritids in North America are of economic importance, 2 of these are known to occur in Florida (Foote, personal comm.).

Of the 56 species recorded from Florida, only 2 species, both of which are introduced, do extensive damage to commercial fruits and vegetables. The damage which could result from introduction of fruit flies into fly-free areas is so great that elaborate efforts have been taken to prevent their spread and establishment in new areas. When the Medfly reappeared in Florida in 1956, after an absence of 26 years following its eradication in 1929-30, more than 6 million acres were treated with insecticides. The campaign involved 46,499 survey traps, 701 state workers plus personnel contracted for aerial spraying and federal personnel and 264 fumigation sites. Nearly \$10 million were expended by state and federal agencies (Oberbacher and Denmark, 1957).

Several species of Anastrepha, Dacus, Rhagoletis and the single species Ceratitis capitata (Wiedemann) and Toxotrupana curvicauda are highly destructive to commercially grown fruits and vegetables in U.S. The most serious fruit fly in Florida now are those in the genus Anastrepha. Anastrepha suspensa (Loew) indigenous to the West Indies, was first collected in Florida in 1931. Following the discovery of this species in 1965, since the discontinuation of eradication effort in 1937, more than 14,000 adults were trapped in Dade Co. (Weems, 1965). There were strong indications that it was a recently introduced strain of suspensa, rather than the reappearance of the old native strain. Spray operations, and field experiments involving the Florida Department of Agriculture, USDA, and University of Florida were set up to obtain accurate information on the seriousness of the introduction and to investigate improved methods of detection control, and eradication. Within its normal range of distribution the economic damage to commercial fruit crops caused by this species has been relatively small. However, a species insect or a particular strain of that species sometimes acts substantially different when introduced into new areas and may become a serious pest in those new areas. There is no assurance that A. suspensa could not become a major pest in Florida. Of less economic importance are Anastrepha interrupta Stone and A. obliqua (Macquart), both of which are found in the southern tip of Florida. A. interrupta is known to attack fruits of Gulf graywig, Schoepfia shreberi J. F. Gmel.,

and A. obliqua is a major pest of mangoes in most tropical countries, however, in Florida, it attacks other tropical fruits of less economic importance.

Other species of fruit flies of economic importance in the continental United States are the apple maggot fly Rhagoletis pomonella, attacking apples, pears, plums, and other deciduous fruits in northeast U.S. and southeast Canada, the walnut husk fly, R. completa Cresson, that attacks all Juglans spp., peaches and other fruits in western U.S. (Christenson and Foote, 1960). The eastern and western cherry fruit fly R. cingulata (Loew) and R. indifference Curran damage sweet and tart cherries (Bush, 1969).

One species of fruit fly, Procecidochares utilis Stone however, is regarded as beneficial and has been introduced into Hawaii for the control of Eupatorium adenophorum Spreng (Stone, 1947).

Cultivated plants in Florida, particularly citrus, mango, and papaya suffer serious damage from fruit fly attack. Horticultural plants such as those in the genus Ilex also suffer reduction in their marketvalue because of damage caused by the larvae of Myoleja limata (Coquillett).

Although fruit flies in most years are not of major economic importance in Florida, their potential to cause serious damage and the likelihood of their introduction exist and these pose a constant threat to Florida's agricultural and economic future.

METHODS AND MATERIALS

Rearing

The seed infesting tephritids are comparatively easy to rear to adults. Composite and other host plants infested with immature tephritids were collected at random in the field and brought into the laboratory for rearing. A dissecting microscope was used to find the immature stages in the buds and heads. Some of the larvae and pupae were removed, killed in boiling water, and preserved in 70% isopropyl alcohol. Larvae and pupae were cross-referenced with emerging adults. The remaining seed head portions of the plants were placed in rearing containers, 3745 ml cartons covered with a transparent plastic sheet, secured by a rubber band. Containers were checked daily to record adult emergence. Plants were kept until they dried or until adults emergence was completed, usually 4 weeks. Adults were pinned or mounted on points. Hundreds of specimens were collected by this method, providing host and seasonal distribution information. New host records can be obtained using this technique, not only for tephritids, but also for agromyzids, cecidomyids, microlepidoptera, and their parasites. Field work allowed biological observation for some species and provided additional distribution information.

Sweeping. Tephritid that commonly breed in composites and other plants were collected frequently by sweeping plants with a net. Unfortunately adults records do not necessarily indicate larval association with a host, although Bush (1966) has shown that adults, as well as immatures of some species of Rhagoletis are intimately associated with their host plants. Many adult visitation records undoubtedly are accidentals and do not represent true host plants. Adult tephritids are attracted to the flowers of many of these non-host plants.

Identification of host plants. Most of the hosts of the common species of Tephritidae were recognized in the field, although some could be field identified only to genus. Samples of other plants were pressed and taken to the plant identification unit of the Division of Plant Industry, Florida Department of Agriculture and Consumer Services, for identification.

Traps. Insect flight traps did not capture large numbers of tephritids but effectively sampled species composition in certain locations. Other traps such as McPhail traps and Steiner traps are of value in fruit fly survey work. Thousands of the traps have been used for detecting and surveying Ceratitidis capitata (Wiedemann) during its eradication programs in 1929-30, 1956-58, 1962-63. Traps are still widely used to detect and survey the population of Anastrepha suspensa (Loew). Different kinds of baits were developed and used in these traps over the years. Among these cottonseed protein hydrolasate + borax formulated in water, angelica seed oil, siglures, ENT 21478, and

hydrolyzed torula yeast + borax in water. They were primarily developed for attraction of Mediterranean fruit fly and Caribbean fruit fly, but other kinds of Diptera were collected as indicated by Steyskal (1977a). Hundreds of thousands of specimens were collected from these traps in Florida over the years. An extensive trapping program is still being carried out in parts of peninsular Florida for the early detection of exotic fruit flies such as the Mexican fruit fly, Mediterranean fruit fly, and Oriental fruit fly should any of these be accidentally introduced into Florida. The distribution maps provided distribution data obtained from AMNH, CNC, CU, FSCA, CCZ, UGA and USNM, whose specimens the author may or may not have seen.

Morphological Studies

Wings and ovipositors were prepared and mounted on slides in Canada balsam using the method described by Steyskal (1977b). Male genitalia and the last abdominal segments were dissected and stored in glycerine in vials. Temporary mounts of male genitalia were prepared by placing in teased genitalic structures in 3-4 drops of phenol on a convex microscope slide. This method is convenient because specimens can be moved into any position desired for examination and illustration.

Some of the specimens were drawn with the aid of camera lucida and/or Bausch and Lomb microprojector. Measurements were made using an ocular micrometer. Photomicrographs of the wing and genitalia were made from some slides using a Zeiss Photo II

compound microscope with phase and interference contrast, using
26 x 36 mm Panatomic film.

CHECKLIST OF FLORIDA TEPHRITIDAE

Genus Toxotrypana Gerstaecker

Toxotrypana Gerstaecker, 1860:191. Type species curvicauda Gerstaecker,
by monotypy.

curvicauda Gerstaecker, 1860:194.

Genus Peronyma Loew

Peronyma Loew, 1873:250. Type species Trypeta sarcinata Loew,
by original designation.

sarcinata (Loew), 1862:218 (Trypeta).

Genus Procecidochares Hendel

Procecidochares Hendel, 1914:91. Type species Trypeta atra Loew,
by original designation.

atra (Loew), 1862:219 (Trypeta)

australis Aldrich, 1929:9.

polita (Loew), 1862:77 (Trypeta).

Genus Paracantha Coquillett

Paracantha Coquillett, 1899:264. Type species, Trypeta culta Wiedemann,
by original designation.

culta (Wiedemann), 1830:486, 680 (Trypeta).

forficula Benjamin, 1934:31.

Genus Eurosta Loew

Eurosta Loew, 1873:280. Type species, Trypeta solidagninis Fitch

(Coquillett, 1910:543).

comma (Wiedemann), 1830:478 (Trypeta).

donyisa (Walker), 1849:1007 (Trypeta).

fenestrata Snow, 1894:169.

floridensis Foote, 1977:148.

Genus Acidogona Loew

Acidogona Loew, 1873:285. Type species, Trypeta melanura Loew,

by original designation.

melanura (Loew) 1873:283. (Trypeta)

Genus Acinia Robineau-Desvoidy

Acinia Robineau-Desvoidy, 1830:775. Type species, jaceae Robineau

Desvoidy (Rondani, 1871b:4:1871:4).

picturata (Snow), 1894:173 (Tephritis).

Genus Acrotaenia Loew

Acrotaenia Loew, 1873:274. Type species, Trypeta testudinea Loew,

by original designation.

testudinea (Loew) 1873:272 (Trypeta).

Genus Euaresta Loew

Euaresta Loew, 1873:296. Type species, Trypeta festiva Loew

(Coquillett, 1910:540).

equalis (Loew), 1862:86 (Trypeta).

bella (Loew), 1862:88 (Trypeta).

Genus Dioxya Frey

Dioxya Frey, 1945:62. Type species, Trypeta sororcula Wiedemann,

by original designation.

picciola (Bigot), 1857:347 (Acinia).

thomae (Curran), 1928:70 (Ensina).

Genus Trupanea Schrank

Trupanea Schrank, 1795:147. Type species, radiata Schrank, by monotypy.

actinobola (Loew), 1873:326 (Trypeta).

ageratae Benjamin, 1934:56.

dacetroptera Phillips, 1923:148.

eclipta Benjamin, 1934:57.

mevarna (Walker), 1849:1023. (Trypeta).

Genus Tephritis Latreille

Tephritis Latreille, 1804:196. Type species, Musca arnicae Linnaeus (Cresson, 1914:278).

subpura (Johnson), 1909:114 (Euaresta).

Genus Dyseuaresta Hendel

Dyseuaresta Hendel, 1928:368. Type species, Euaresta adelphica Hendel, by original designation.

mexicana (Wiedemann), 1830:511 (Trypeta).

Genus Euarestoides Benjamin

Euarestoides Benjamin, 1934:57. Types species, Trypeta abstersa

Loew, by original designation.

abstersus (Loew), 1862:221 (Trypeta).

Genus Myoleja Rondani

Myoleja Rondani, 1856:112 Type species Tephritis lucida Fallen,
by original designation.

limata (Coquillett), 1899:263. (Aciura).

nigricornis (Doane), 1899:163 (Aciura).

rhino Steyskal, 1972:207.

Genus Xanthaciura Hendel

Xanthaciura Hendel, 1914:86. Type species, Trypeta chrysura
Thomson, by original designation.

chrysura (Thomson), 1869:580 (Trypeta)

connexionis Benjamin, 1934:45.

insecta (Loew), 1962:72 (Trypeta).

tetraspina (Phillips), 1923:132 (Aciura).

Genus Stenopa Loew

Stenopa Loew, 1873:234. Type species, Trypeta vulnerata Loew,
by original designation.

vulnerata (Loew), 1873:232 (Trypeta)

Genus Neaspilota Osten Sacken

Neaspilota Osten Sacken, 1878:192. Type species, Trypeta alba
Loew, automatic.

achilleae Johnson, 1900:328.

dolosa Benjamin, 1934:39.

floridana Rohani n.sp.

punctistigma Benjamin, 1934:38.

vernoniae (Loew), 1861:346. (Trypeta)

Genus Ceratitis Macleay.

Ceratitis Macleay, 1829:482. Type species, citriperda Macleay,
by monotypy.

capitata (Wiedemann), 1830:496. (Trypeta)

Genus Anastrepha Schiner

Anastrepha Schiner, 1868:263. Type species, Dacus serfentinus
Wiedemann, by original designation.

edentata Stone, 1942:48.

interrupta Stone, 1942:62.

nigrifascia Stone, 1942:91

obliqua (Macquart) 1835:703 (Tephritis)

ocresia (Walker), 1849:1016 (Trypeta)

suspensa (Loew), 1862:69 (Trypeta).

Genus Rhagoletis Loew

Rhagoletis Loew, 1862:44. Type species, Musca cerasi Linnaeus,
by monotypy.

chionanthi Bush, 1966:482.

cingulata cingulata (Loew), 1862:76 (Trypeta).

cornivora Bush, 1966:470

mendax Curran, 1932:7

osmanthi Bush, 1966:478

pomonella (Walsh), 1867:343 (Trypeta).

Genus Zonosemata Benjamin

Zonosemata Benjamin, 1934:17. Type species Trypeta electa Say,
by original designation.

electa (Say), 1830:185 (Trypeta)

Genus Strauzia Robineau-Desvoidy

Strauzia Robineau-Desvoidy, 1830:718. Type species, inermis

Robineau-Desvoidy (Coquillett, 1910:609 = longipennis
(Wiedemann)).

longipennis (Wiedemann), 1830:483 (Trypeta).

Genus Euleia Walker

Euleia Walker, 1835:81. Type species, Musca onopordinis Fabricius,
by monotypy.

fratria (Loew), 1862:67 (Trypeta).

Genus Tomoplagia Coquillett

Tomoplagia Coquillett, 1910:591, 615. Type species, Trypeta

obliqua Say, automatic.

obliqua (Say), 1830:186 (Trypeta).

TAXONOMIC TREATMENT

Key to The Florida Genera of Tephritidae

1. Head bristles short; the fronto-orbitals weak; ocellar absent;
ovipositor very long and cylindrical Toxotrypana
- 1'. Head bristles well-developed, the fronto-orbitals strong;
ocellar present, ovipositor long and normal. 2
2. Dorsocentral bristles closer to a transverse line between
acrostichals bristles than to a line between supra-alar
bristles. 3
- 2'. Dorsocentral bristles closer to a transverse line between
supra-alar bristles than to a line between acrostichal bristles
. 4
3. Third antennal segment with normal rounded tip; vein M_{1+2}
distinctly curving anteriorly at apex (Fig. 15 . . . Anastrepha.
- 3'. Third antennal segment with sharp awl-shaped tips, vein M_{1+2}
without distinct anterior curve at apex (Fig. 67.
. Zonosemata
4. One pair of upper fronto-orbital bristles. 5
- 4'. Two or three pairs of upper fronto-orbital bristles. 7
5. Scutellum enlarge, shining black or dark brown, with 1 or 2
pairs of scutellars; antennae conspicuously longer than 1/2
length of face; males with normal fronto-orbital bristles. . . 6

- 5'. Scutellum normal, yellow to dark brown, with 2 pairs of scutallars, antennae not longer than 1/2 of face length; males with some of the lower fronto-orbital enlarged. Strauzia
6. Scutellum with 1 pair of scutellars, dark brown and appearing bilobed. Peronyma
- 6'. Scutellum with 2 pairs of scutellars, shining black. Procecidochares
7. Dorsocentral bristles closer to a line between supra-alar bristles than to a transverse suture. 8
- 7'. Dorsocentral bristles closer to the transverse suture than to line between supra-alar bristles. 13
8. Crossvein r-m situated approximately at midpoint of cell 1st M_2 9
- 8'. Crossvein r-m situated distinctly apical of midpoint of cell 1st M_2 10
9. Third antennal segments distinctly pointed dorso-apically; with 3 pairs of lower fronto-orbital bristles; scutellum normal; wing without basal maculations. Rhagoletis
- 9'. Third antennal segment rounded dorso-apically; with 2 pairs of lower fronto-orbital bristles; scutellum swollen; wing with basal maculations. Ceratitis
10. Posterior upper fronto-orbital bristles convergent; wing hyaline, dark pattern of wing usually confined to stigma and occasionally some of the veins (Fig. 36). . . . Neaspilota
- 10'. Posterior upper fronto-orbital bristles not convergent; wing with distinct yellow to dark brown pattern on the disc. . . . 11

11. Some postocular bristle pale; wing dark with hyaline and semihyaline spots, more or less reticulated pattern (Fig. 26)
 Eurosta
- 11'. All postocular bristles black; wing with yellow to dark brown band, not appearing reticulated. 12
12. Anterior oral margin strongly developed and projecting. . . .
 Euleia
- 12'. Anterior oral margin not strongly developed or projecting. . .
 Myoleja
13. One or two pairs scutellar bristles, if 2 head with length greater than height; mouth geniculate with labellum long and slender. 14
- 13'. Two pairs of scutellar bristles, head not longer than high
 17
14. Two pairs of lower fronto-orbital bristles. 15
- 14'. Three pairs of lower fronto-orbital bristles. 16
15. Head distinctly longer than high; proboscis geniculate, labellum elongate. Dioxyna
- 15'. Head usually with height distinctly greater than length; proboscis not geniculate; labellum not elongate. . Dyseuaresta
16. Wing pattern with a preapical stellate dark pattern, with large hyaline areas on basal 1/2 of wing disk (Fig. 58)
 Trupanea
- 16'. Wing without stellate pattern; with only small hyaline areas confined to costa and anal margin (Fig. 63)
 Xanthaciura

17. Two pairs of lower fronto-orbital bristles. 18
- 17'. Three pairs of lower fronto-orbital bristles. 20
18. Three pairs of upper fronto-orbital bristles; 3rd antennal segment with apico-dorsal point; abdomen marked with black spots. Acidoqona
- 18'. Two pairs of upper fronto-orbital bristles; 3rd antennal segment rounded; abdomen without such markings. 19
19. Anterior oral margin not strongly projecting anteriorly; male with fore femur swollen and with striations on epandrium; stigma with hyaline spot. Euaressta
- 19'. Anterior oral margin not projecting anteriorly; males without such characters; stigma never with hyaline spots, always with dark markings. Tephritis
20. Three pairs of upper frontal orbital bristles; wing pattern with dark rays going to margin. Paracantha
- 20'. Two pairs of upper fronto-orbital bristles; wing without such pattern. 21
21. Wing with distinct oblique bands Tomoplagia
- 21'. Wing without such pattern; consisting of dark field with hyaline spots, or with subapical stellate pattern, or with basal maculation and distinct apical banding. 22
22. Wing broad, with distinct dark bands on a hyaline field or with basal maculations and apical bands. 23
- 22'. Wing elongate, consisting of a dark field with hyaline spots or with a dark subapical stellate pattern. 24

23. Eye with height more than $1\frac{1}{2}$ times as great as width;
cell 2nd C more than twice as long as the short stigma;
wing with distinct dark bands (Fig. 53). Stenopa
- 23'. Eye height not exceeding $1\frac{1}{2}$ times as great as width;
cell 2nd C not more than twice as long as length of the
short stigma; wing with maculation and apical bands
(Fig. 14'). Acrotaenia
24. Vein R_{4+5} strong setose dorsally; wing pattern more or less
evenly reticulate; hyaline spots surrounded by a rim of
infuscation darker than the yellowish parts of the wing
disc (Fig. 13). Acinia
- 24'. Vein R_{4+5} bare dorsally; wing pattern with a Trupanes-like
subapical stellate pattern and with yellowish spots on basal
 $1/2$ of wing disc (Fig. 28). Euarestoides

Genus Acidogona LoewAcidogona Loew, 1873, Smiths, Misc. Collect. 256(11):285Type species: Trypeta melanura Loew.

Readily differentiated from other Tephritinae by the predominantly brown wing with reticulate wing pattern and the distinct median and lateral spots on a yellow abdomen. All head and body bristles black; head comparatively broad from frontal view about 1/2-2/3 wider than high frons short and pubescent. Three pairs of upper fronto-orbitals, the upper 2 pairs set inside, 2 pairs of lower fronto-orbitals. Dorsum of thorax black with yellow scale-like bristles; humeral and lateral areas luteous. Dorsocentral bristles approximately in line with anterior supra-alars and close to transverse suture. Scutellum with 2 pairs of bristles. Legs yellow entirely. Abdomen luteous, dorsum covered with black bristles intermixed with yellow.

All known larvae breed singly in the flower heads of Hieracium. The only Nearctic species known, melanura (Loew), occurs in northeastern United States to Florida (Foote, 1965).

Acidogona melanura (Loew)

Figs. 12, 68, 117

Trypeta melanura Loew, 1873, Smiths. Misc. Collect. 256(11):
283 pl. XI, Fig. 6. Holotype ♀. Type locality: District of Columbia.

Rather small species with characteristic wing markings, an entirely dark brown wing with the presence of hyaline spots in all the wing cells. Vein R_4+5 with bristles occupying more than $1/2$ the length of cell R. This predominantly yellow to brown species has characteristic dark markings on the scutellum and abdomen. Female ovipositor short, approximately 1.7 mm long; the ovipositor sheath black, as broad as length, measured 0.8 mm long; and piercer short 0.5 mm in length, abruptly pointed at apex, shaped as Fig. 6. Male genitalia as in Fig. 68, epandrium rounded, luteous with black markings on the sides; surstyli very long and slender, apex rounded; proctiger small and elongated.

Length body 3.7-3.4 mm; wing 3.6-3.7 mm. (N=8).

Hosts: Hieracium argyreaum Small

Hieracium gronovii L.

Hieracium scabrum Michx.

Hieracium sp.

Distribution: Massachusetts to Florida.

Florida Records: Alachua Co.: Gainesville, 1♀ insect flight trap, 21-IX-1973 (H. V. Weems, Jr., FSCA): 1♀ insect trap 28-IX-1973 (H. V. Weems, Jr., FSCA): 1♀, insect flight trap, 12-X-1973 (H. V. Weems, Jr., FSCA): 5♂ 3♀, bred from Hieracium gronovii, 22-X-1979 (I. B. Rohani, FSCA): 3♂ 3♀, Hieracium gronovii, 13-21-X-1979 (I. B. Rohani, FSCA) Brevard, Co., Merritt Island, 4♂ 6♀, bred from Hieracium argyreaum 2-V-1930 (D. J. Nicholson, FSCA): Hillsborough Co.: Tampa, 3♂ 2♀, bred from Hieracium argyreaum,

29-IV-1930 (Pope & White, USNM); 1♂ 5♀, bred from Hieracium argyraeum 5-I-1930 (Park & White, USNM); Indian River Co.: Indian River City, 10♂ 6♀, bred from Hieracium argyraeum, 13-V-1930 (D. J. Nicholson, USNM); 5♂ 2♀, bred from Hieracium argyraeum, 6-VI-1930 (D. J. Nicholson, USNM); Levy Co.: Cedar Key, 1♂ 2♀, bred Hieracium argyraeum, 18-III-1979 (I. B. Rohani, FSCA); Orange Co.: Orlando, 6♂, bred from Hieracium scabrum, 17-25-I-1930 (D. J. Nicholson, USNM); Orlovista, 9♂, bred from Hieracium scabrum, 10-18-X-1930 (D. J. Nicholson, USNM); Polk Co.: Griffin, 5♂ 1♀, bred from Hieracium argyraeum, 16-19-V-1930 (Pope & White, USNM).

This species is commonly reared from all species of Hieracium. It is generally distributed in Florida. This is the only Florida species with distinctive black markings on the abdomen. The immature stages were briefly described by Benjamin (1934).

Genus Acinia Robineau-Desvoidy

Acinia Robineau-Desvoidy, 1830, Acad. Roy. des Sci. Mem.

2:775. Type species: jaceae Robineau-Desvoidy + corniculata (Zetterstedt).

Small yellowish pollinose species with all bristles yellow-brown. Wing with numerous hyaline spots on a dark field; hyaline spots surrounded by a rim of infuscation darker than yellowish parts of wing disc. Vein $R_4 + 5$ with scattered setae extending over most of its length. Typically with 2 pairs of upper fronto-orbitals, and 3 pairs of lower fronto-orbital bristles. Frons pubescent;

parafrontals with a band of pale hairs. All bristles strong; Dorso-central bristles closer to transverse suture, in front of a line between anterior supra-alar bristles. Scutellum with 2 pairs of scutellars. Abdomen yellow except ovipositor sheath, tinged with brown.

The larvae breed in the flower heads of Pluchea. Only 1 North American species is known. A detailed discussion of the genus was given by Benjamin (1934). Foote and Blanc (1963) discussed its distribution in California.

Acinia fucata (Fabricius)

Figs. 13, 69, 118

Musca fucata Fabricius, 1794. Entomol. Syst. 4:359. Type (sex unknown) "Americae meridionalis insulis."

Tephritis picturata Snow, 1894, Kans. Univ. Quart. 2:173. Holotype ♀. Type-locality: Frazer, Florida.

Readily differentiated from other Florida fruit flies by the generic characters given above; with characteristic wing venation and markings (Fig. 13). Predominantly yellow species, with head slightly higher than long; face short, concave and epistomal margin slightly raised. Female ovipositor yellow to rufous, about 2.5 mm long. The ovipositor sheath approximately equal in length to piercer, being 0.9 mm and 0.8 mm long respectively. Piercer sharp at apex. Male genitalia small and compact (Fig. 69). Epandrium highly arched with long erect bristles

dorsally. Surstyli curved inward and rounded at apices. Pro-tiger small and elongated, with numerous short fine hairs.

Length: body 4-5.0 mm; wing 3, 4-3.6. (N=10).

Hosts: Pluchea foetida (L.) DC.

Pluchea imbricata (Kearney) Nash

Pluchea odorata (L.) Cass.

Pluchea purpurascens (Sw.) DC.

Pluchea rosea Godfrey

Pluchea sp.

Distribution: California to Florida, New York to Georgia, Mexico and West Indies.

Florida Records: Alachua Co.: Gainesville 2♂ 2♀, CO₂ baited insect flight trap. 13-VIII-1976 (G. B. Fairchild, FSCA); Newberry, 1♀, 19-XI-1911 (AMNH); Collier Co.: Corkscrew Swamp Sanctuary, 1♂ 1♀, insect flight trap, 6-7 IV-1972 (H. V. Weems, Jr., FSCA), Dade Co.: Coral Gables, 3♂ 3♀, Trema micranthus, 1-V-1957 (H. V. Weems, Jr., FSCA), Hialeah, 1♂, swept Solidago odora, 29-IX-1965 (C. E. Stegmaier, Jr., FSCA); Homestead, 1♀, 1-III-1924 (G. C. Steyskal, CNC); 1♀ ex Senecio, 28-IX-1948 (O. D. Link, FSCA) Royal Palm Hammock, 1♂, 4-XII-1961 (Munroe, Holland, & Chillicot, CNC) Duval Co.: Jacksonville 1♂, 3-XI-1911 (AMNH) 3♂ 2♀, fruit fly trap, 2-VIII-1960 L. W. Taylor, FSCA); Flager Co.: 1♂ 2♀, 8-VIII-1956 (H. V. Weems, Jr., FSCA); Jefferson Co.: Monticello 1♀ 4-8-X-1914 (AMNH); Levy Co.: 2♂ 1♀, 19-VII-1958 (H. V. Weems, Jr., FSCA); Monroe Co.: Big Pine Key, 7♂ 10♀, 25-III-1967, (J. Novak, FSCA); 23♂ 15♀ bred swept Pluchea

odorata, 24-11-1978 (H. V. Weems, Jr., FSCA) 23♂ 15♀, bred from Pluchea odorata, 24-27-III-1978 (H. V. Weems, Jr.s, FSCA); 20♂ 60♀, bred from Pluchea odorata, 24-28-III-1978 (I. B. Rohani, FSCA) Key West, 1♂ 1♀, bred from Pluchea odorata, 22-XI-1930 (D. J. Nicholson, USNM); 1♂ 3♀, bred from Pluchea odorata, 16-IV-1945 (NSNM); Orange Co., Orlando, 20♂ 12♀, bred from Pluchea imbricata 9-20-IX-1930 (D. J. Nicholson, USNM); 2♂, bred from Pluchea imbricata 9-IX-1930 (D. J. Nicholson, FSCA); Sarasota Co.: Venice, 2♂, bred from Pluchea purpurescens, 12-V-1930 (D. J. Nicholson, USNM); Taylor Co.: Perry, 1♂, 6-IX-1970 (W. Atyeo, UGA).

It is generally widespread in Florida. Larvae breed commonly in Compositae; Pluchea. Larvae are bean-shaped and usually are densely covered with minute spines. Detailed description of the immature stages was given by Benjamin (1934).

Genus Acrotaenia Loew

Acrotaenia Loew, 1873, Smiths. Misc. Collect. 11(256):274.

Type-species: Trypeta testudinea Loew

Readily differentiated by its distinctive wing markings. Apical 1/3 of wing typically with 3 dark brown bands arising from dark field at costa and extending through cell 2nd M₂ to posterior margin. The basal 1/2 of wing dark brown with numerous small hyaline spots which coalesce into longitudinal spots of some points. Posterior margin with large hyaline areas. Costal margin with large dark brown to black spots. Vein R₄ + 5 setose to almost its

length. Predominantly yellow brown to brown bristles, head higher than long. Two pairs of upper fronto-orbitals, the anterior pair thickened with 3 pairs of lower fronto-orbitals. Thorax black rather densely gray pollinose with short yellow brown setae over dorsum. Dorsocentral bristles close to transverse suture and closer to a transverse line between supra-alar bristles than to a line between acrostichal bristles. Scutellum with two pairs of scutellars. Abdomen black densely gray pollinose with yellow brown setae dorsally.

Nothing is known about the biology of the species. The single species in North America is known from Florida and has been reported from Cuba and Puerto Rico. Foote (1960a) illustrated the wing and included the first record for United States.

Acrotaenia testudinea (Loew)
Figs. 14, 70, 119

Trypeta testudinea Loew, 1873, Smiths. Misc. Collect. 11(256): 272, pl XI Fig. 13. Holotype ♀. Type locality: Cuba (Berlin Museum).

Mostly yellowish brown species with densely gray pollinose over mesonotum. Easily differentiated from the other Tephritidae by the distinctive wing markings (Fig. 14). Predominantly dark brown, with a combination of patterns typically for the genus. Female ovipositor sheath yellow tinged with brown on the proximal and distal apices, with numerous brown setae dorsally, about 1.0 mm long. Piercer 0.9 mm, long and slender, apex gradually tapers to a point.

Male genitalia as in Fig. 70. Epandrium dark brown to black, with numerous long setae dorsally and laterally, with a clump of long fine setae at the lower inner margin. Surstyli short and broad, rather truncate at apices. Proctiger small and elongate with scattered setae lateroventrally.

Length: body 4.0-4.2 mm wing 3.9-4.1 mm. (N=3).

Hosts: Unknown

Distribution: Florida, Cuba, Puerto Rico.

Florida Records: Monroe Co.: Big Pine Key, 1♀ McPhail trap, 26-I-1936 (J. J. Cooper, FSCA).

This species is rare in collections. This is the only specimen represented in the United States. Detail description of this species was given by Loew (1873).

Genus Anastrepha Schiner

Anastrepha Schiner, 1868, Reise der Novana, 2:263. Type-species: Dacus serfentinus Wiedemann.

Mostly yellow with thorax and abdomen densely yellow pollinose, with brown hairs never mesonotum and abdomen. The major head and thoracic bristles black. Head yellow distinctly higher than long; epistomal margin slightly concave in profile. Usually with 2 pairs of upper fronto-orbital bristles and 3-5 pairs of lower fronto-orbital bristles. Thorax with a black spot behind wing and under squama. Dorsocentral bristles closer to a transverse line between acrostichal bristles than to a line between supra-alar bristles.

Scutellum with 2 pairs of scutellars. Wing marking with an inverted V-shaped and S-shaped brown bands, with other markings at the base. Vein $M_1 + 2$ distinctly curving anteriorly at apex. Vein R_1 setose entire length. Vein $R_4 + 5$ setose to beyond r-m crossvein. Legs entirely yellow. Abdomen with numerous brown hairs on the tergites. Ovipositor sheath, a subcylindrical tapering tube, at least 2 times as long as width at the base.

The genus is restricted to the New World, and ranges from latitude 27°N to 35°S. Members of this genus are the most important native pests of a broad spectrum of fruits, vegetables, and other crops in tropical and subtropical America. Of the 155 described species, only 16 are known to occur within the United States, and 6 species have been recorded from Florida. Studies on the biology and identification of Anastrepha species have been summarized at some length by Weems (1965, 1967a, 1967b, 1968a, 1968b, and 1970). The revision of the genus by Stone (1942a) remains the standard work for the identification of the species. Steyskal (1977b) provided a pictorial key to all the species. Bush (1962) presented the cytotoxonomy of the larvae for some Mexican species in this genus.

Key to the Florida Species of Anastrepha¹

1. Wing pattern predominantly dark brown; distal arm of V-band reduced or separated from proximal arm or narrowly joined to

¹This key is designed for females. Satisfactory characters that can be used in a key have not yet been discovered for most males.

- the side of latter at vein $M_1 + 2$ (Fig. 19); metanotum predominantly dark brownish to black. ocresia (Walker)
- 1'. Not with this combination of characters 2
2. Piercer less than 2.0 mm long, apex tapered with many fine or large rounded serrations. 3
- 2'. Piercer at least 2.0 mm long, apex tapered but unserrated. . . 5
3. Mesonotum yellow brown with rather broad median brown stripes; median scutoscuteellar black spot lacking. . . obliqua (Macquart)
- 3'. Mesonotum yellow brown, lacking any stripe; median scutoscuteellar black spot present. 4
4. V-band narrowly joined to S-band (Fig. 20); apex of piercer distinctly narrowed with larger rounded serrations; hyaline spot on costa, beyond stigma reaching vein $R_4 + 5$ just anterior of r crossvein. suspensa (Loew)
- 4'. V-band separated from S-band (Fig. 16): apex of piercer broad with many fine serrations; hyaline spot confined to anterior $1/2$ of cell R_1 , only occasionally touching vein $R_2 + 3$ interrupta Stone
5. A dark brown transverse band on posterior margin of mesoscutum; S-band with a shallow notch in cell Cu_1 , margin of band rounded before it (Fig. 17); piercer not more 2 mm; wing at most 7.5 mm long. nigrifascia Stone
- 5'. Mesoscutum without such markings; S-band without any notch (Fig. 15); piercer 3.0-4.3 mm long; wing rarely more than 6 mm long. edentata Stone

Anastrepha edentata Stone

Figs 15, 71, 120

Anastrepha edentata Stone, 1942, U.S. Dept. Agric. Misc. Publ. 489:48, pl. 8, Fig. 7. Holotype ♀. Type locality: Key Largo, Florida (USNM).

Small yellowish species with 4 brown stripes on mesonotum. Head with 2 pairs of upper fronto-orbital bristles and 5 pairs of lower fronto-orbital bristles. Mesonotum yellow with 2 long lateral stripes extending from anterior margin to the bases of dorsocentral bristles, and 2 short submedian stripes ending in areas between dorsocentrals, just anterior of acrostichals. Wing with yellow brown bands, costal and S-bands separated on vein $R_4 + 5$, but may be separated or connected on vein $R_2 + 3$, or cell R may be infuscated totally by the 2 bands. V-band usually connected to S-band. Legs yellow. Anterior 1/2 of abdominal tergite brown with rows of dark brown setae, posterior 1/2 with yellow setae. Ovipositor sheath long, slender and tapering about 3.6 mm long. The piercer long, slender sharp-pointed, 3.4 long with apex gradually tapering to a rather rounded tip. Epandrium yellow (Fig. 71) with scattered long setae over the dorsum. Surstyli short and narrow, apices tapered to a sharp tip. Proctiger large, with long setae lateroventrally.

Length: body 6.5-7.8 mm; wing 6.3-7.5 mm (N=10)

Hosts: Unknown

Distribution: Florida, Puerto Rico.

Florida Records: Monroe Co.: 1♂ McPhail trap, 20-II-1936 (J. H. Sealey, FSCA); 1♀, McPhail trap, 14-IX-1936 (McDaniel, FSCA);

1♀, McPhail trap, 16-IX-1936 (McDaniel & Barcus, FSCA); 1♂, McPhail trap, 21-IX-1936 (McDaniel & Barcus, FSCA); 1♂ McPhail trap, 19-X-1936 (McDaniel FSCA); 1♂, McPhail trap, 29-VII-1936 (J. H. Sealey, FSCA); Big Pine Key (paratype), 1♂, 24-X-1935 (Barcus & Moore, USNM); 1♀, 26-XI-1935 (H. R. Winker, FSCA); 1♂ 1♀, McPhail trap, 21-24-IV-1936 (J. F. Cooper, FSCA); 1♀, McPhail trap, 5-V-1936 (J. F. Cooper, FSCA); Key Largo, 1♀, McPhail trap, 31-VIII-1936 (Barcus & Stirling, FSCA); (paratypes) 7♂ 6♀, 16-28-IX-1936 (Barcus & McDaniel, USNM); 1♂ 1♀, McPhail trap, 14-IX-1936 (Barcus & McDaniel, USNM); 1♂ 1♀, McPhail trap, 5-X-1936 (McDaniel & Barcus, FSCA); 1♀, McPhail trap, 19-XI-1936 (McDaniel & Barcus, FSCA); 1♀, 7-XII-1936 (D. F. Marcus, FSCA); 1♀, McPhail trap, 14-XII-1936 (J. H. Sealey, FSCA); 1♂ 1♀, McPhail trap, 29-XII-1936 (McDaniel & Barcus, FSCA); 1♀, McPhail trap, 2-I-1937 (McDaniel & Barcus, FSCA); Key West, 1♂, 10-IV-1936 (E. G. Hume, FSCA); 1♀, McPhail trap; 4-V-1936 (J. F. Cooper, FSCA); (paratype) 1♀, 28-V-1936 (E. G. Hume, USNM). No Name Key, 1♂, McPhail trap, 15-I-1936 (R. B. Johnson, FSCA); 1♂, 7-11-1936 (J. F. Cooper, FSCA); 1♂ McPhail trap, 25-II-1936 (J. F. Cooper, FSCA, 1♂ 13-III-1936 (J. F. Cooper, FSCA) 1♂, McPhail trap 17-III-1936 (J. F. Cooper, FSCA) 2♂ McPhail trap, 24-IX-1936 (J. F. Cooper, FSCA), Sugar Loaf Key, 1♂, 7-XI-1936 (Barcus & Moore, FSCA); Tavernier, 1♂, McPhail trap, 14-IX-1936 (McDaniel, FSCA).

A. edentata is one of the 6 species which have been established in Florida at some time. The records indicated that, it has not been found in Florida since 1936. There is a possibility

that this species has not survived in Florida. Nothing is known about the biology of this species. It is not considered to be of economic importance anywhere within its range. Females of this species are differentiated easily by the distinctly long slender, ovipositor which is about as long as or longer than the length of the body.

Anastrepha interrupta Stone
Figs. 16, 72, 121

Anastrepha interrupta Stone, 1942, U.S. Dept. Agric. Misc. Publ. 439:62, pl. 12, Fig. II. Holotype ♀. Type locality: Jensen, Florida (USNM).

Readily differentiated from other Florida Anastrepha by the shape of the piercer and by the presence of a median black scutoscuteellar spot. Head yellow, typically with 2 pairs of upper fronto-orbital bristles and 4 pairs of lower fronto-orbital bristles. Wing pattern as in Fig. 16. V-band separated from S-band. Hyaline spots on anterior 1/2 of cell R_1 only occasionally touching vein $R_2 + 3$. Vein R_{4+5} setose to beyond r-m crossvein, ending just at the base of V-band. Female positor about 3.5 mm long. Ovipositor sheath 1.5 mm long, entirely yellow with numerous brown hairs. Piercer long and slender, approximately 1.0 mm long; apex short and broad, abruptly tapered to a sharp point with many fine serrations on lateral margin. Male genitalia as in Fig. 72. Epandrium narrow

with few long setae on dorsum. Surstyli slender and attenuated, curved inward at apices, and with a clump of short setae on inner margin. Proctiger small and elongate, with dense long setae lateroventrally.

Length: body 6.4-7.6 mm; wing 6.0-7.4 mm. (N=10)

Hosts: Schoepfia shreberi J. F. Gmel.

Distribution: Florida

Florida Records: Broward Co., 1♀ McPhail trap, 17-II-1936 (G. D. Barcus, FSCA); 1♂, McPhail trap, 21-II-1936 (L. S. Light, Jr., FSCA); Coconut Grove, 1♂, McPhail trap, 10-XI-1936 (G. B. Merrill, FSCA); Deerfield (paratypes), 1♂ 2♀, trap, 17-20-II-1936 (Barcus & Solomon, USNM); Ft. Lauderdale (paratype), 1♂, 10-I-1936 (Solomon & Barcus, USNM); 2♂ 2♀, McPhail trap, 24-VII-1953 (FSCA); 3♂ 2♀, at Chrysobalanus icaco, 14-VIII-1953 (O. D. Link FSCA); Dade Co.; 1♀, McPhail trap, 4-I-1936 (O. W. Calkin, FSCA); 2♂, 25-I-1936 (C. R. Roberts, FSCA); 1♂ McPhail trap, 5-II-1936 (W. Ludlam, FSCA); 3♂ 3♀, McPhail trap, 15-19-II-1936 (C. R. Roberts, FSCA); 5♂ 2♀ McPhail trap, 28-XII-1936 (G. D. Barcus, FSCA); 8♂, McPhail trap, 6-12-I-1937 (G. D. Barcus, FSCA); 1♂ 2♀, McPhail trap, 21-VI-1937 (O. D. Link, FSCA). 1♂, McPhail 8-V-1956 (Avery & Burke, FSCA); Opalocka, 3♂ 5♀, McPhail trap (Grapefruit). 5-IV-1962 (Brewton, FSCA); Coral Gables, 1♀, McPhail trap, 15-VI-1949 (W. W. Calkins, FSCA); 1♂ 2♀, McPhail trap, 19-VII-1949 (O. D. Link, FSCA); 1♂ 1♀ McPhail trap, 27-VI-1949 (O. D. Link, FSCA); 1♂ 1♀, McPhail trap, 9-IX-1949, (O. D. Link, FSCA); 3♂ 1♀, McPhail trap, 4-X-1949

O. W. Calkin, FSCA); 2♂ 2♀, ex Schoepfia schreberi, 12-II-1951 (G. G. Butcher, USNM); 1♂, ex Schoepfia schreberi, 12-18-II-1951, (F. G. Butcher, USNM); Florida City, 2♂, McPhail trap, 20-26-II-1936 (C. R. Roberts, FSCA); 1♂, McPhail trap, 7-XII-1936 (G. D. Barcus, FSCA); 2♂ McPhail trap, 21-23-XII, 1936 (J. H. Sealey, FSCA); Homestead, 1♂, in McPhail, 23-I-1936 (C. R. Roberts, FSCA); 1♂ 1♀, in McPhail trap, 11-II-1936 (C. R. Roberts, FSCA); 4♂, in McPhail trap, 14-VII-1936 (G. D. Barcus FSCA); 5♂ 5♀, Schoepfia schreberi, 3-I-1951 (USNM) 1♂, 9-IV-1955 (H. V. Weams, Jr.; FSCA); 1♂ 1♀, 3-V-1956 (Wolfenbarger, USNM) 1♀, Dry trap, 25-VI-1956 (R. P. Burke, USNM); 1♂ 2♀, in McPhail trap, 3-V-1961 (C. I. Dowling, Jr., FSCA); 1♂, in McPhail trap, 10-I-1962 (C. J. Fay, FSCA), 1♂ 1♀, in McPhail trap in Mango tree, 21-III-1962 (C. J. Fay, FSCA); Miami, 1♂, in McPhail trap, 27-I-1936 (G. D. Barcus, FSCA); 1♂ 1♀ and in McPhail trap, 6-II-1936 (G. D. Barcus, FSCA); 2♂, in McPhail trap, 28-XII-1936 (O. D. Link FSCA); 1♂ 1♀, 13-X-1949 (O. W. Calkin, FSCA); 1♂, in fruit fly trap, 18-IV-1960 (M. S. Creamer, Jr. FSCA); 1♂ 1♀, in McPhail trap, 15-IV-1960 (J. N. Todd, FSCA); 3♂, in McPhail trap, 21-XII-1961 (J. A. Stephens, FSCA); 3♂, in McPhail trap, 15-21-II-1962 (J. A. Stephens, FSCA); 1♂, in McPhail trap, 8-III-1962 (J. A. Stephens, FSCA) Naranja, 3♂ 3♀, reared from fruits of Schoepfia schreberi, IV-1962 (R. M. Baranowski, USNM); Royal Palm Park (paratypes), 4♂ 2♀, trap in poisonwood tree, 29-I-1936 (Ludlam-Roberts, USNM); South Miami (paratypes), 2♂, trap, 3-I-1936 (Baker & Solomon, USNM); Lee Co.: Tice, 1♂, wet bait trap, 30-V-1956 (T. R. Adkins, USNM); Martin Co.: 1♂, in McPhail trap, 6-II-1936

(O. D. Link, FSCA); 2♂, in McPhail trap, 20-24-III-1936 (O. D. Link, FSCA); 1♂, 1♀ in McPhail trap, 14-IV-1936 (O. D. Link, FSCA); 1♂ 1♀, in McPhail trap, 6-XI-1958 (G. W. Campell, FSCA) 1♂, in wet fruit fly trap, 15-V-1959 (G. W. Campell, FSCA); Hobe Sound, 1♂ in McPhail trap, 1-III-1962 (E. E. Prange, FSCA); 1♂, McPhail trap in rose apple, 23-III-1962 (E. Prange, FSCA); Port Sewell, (paratype) 4♂, trap, 13-III-1936 (O. D. Link, USNM); 3♂ 3♀, in McPhail trap in grapefruit trees, 15-20-IV-1962 (E. Prange, FSCA); Salerno, 1♂, in McPhail trap in Mango tree, 30-III-1962 (E. Prange, FSCA); Sewell point, 1♂, in McPhail trap, 12-V-1961 (E. Prange, FSCA); Stuart, 2♂, in McPhail trap. 14-IV-1936 (O. D. Link, FSCA); 1♂ 1♀, in McPhail trap, 15-IV-1960 (E. W. Campell, FSCA); 2♂ 2♀ in McPhail trap, 25-29-V-1962 (E. Prange, FSCA); Monroe Co.: Big Pine Key, 1♂, in McPhail trap, 26-I-1936 (T. J. Cooper, FSCA); Everglades Nat'l Pk, 20-X-1954 (H. Denmark, FSCA); Palm Beach, West Palm Beach (paratype) 1♀, trap, 12-III-1936 (O. D. Link, USNM); 1♂ 1♀, in McPhail trap in grapefruit 6-XI-1963 (M. L. Messec, FSCA), St. Lucie Co.: Ft. Pierce, 1♀, in McPhail trap, 13-V-1936 (R. W. Lindner, FSCA); 2♂ 3♀, in trap 11-V-1956 (R. A. Murphy, FSCA). Jensen, 2♂ 2♀, in McPhail trap, 7-IV-1936 (C. R. Roberts, FSCA). St. Lucie, 1♂, wet bait trap, 28-V-1956 (A. E. Irana, USNM)

Female of this species closely resembles suspensa, except for the shape of the piercer of the ovipositor and the infuscation on the wing. Unlike suspensa, this species has never been found to be of economic importance. Nothing is known about the biology,

although adults have been reared several times from the fruit of
Schoepfia schreberi L.

Anastrepha nigrifascia Stone

Figs. 17, 73, 122

Anastrepha nigrifascia Stone, 1942, U.S. Dept. Agric.

Misc. Publ. 439:91, pl. 19, Fig. 18. Holotype ♀. Type locality:
Big Pine Key, Florida (USNM).

Rather small yellow brown species. Easily differentiated from other Florida Anastrepha by the presence of a distinct transverse dark brown band across the posterior of mesoscutum at the base of the scutellum. Also by having the apex of the piercer unserrated and gradually tapering to more or less rounded tip. Head yellow with 2 pairs of upper front-orbital bristles and usually 5 pairs of lower fronto-orbital bristles. Wing pattern predominantly brown, costal and S-band joined at vein $R_4 + 5$. S-band reaching vein $M_1 + 2$ apically. V-band narrowly connected to S-band anteriorly with proximal arm of V-band constricted or broken in cell R_5 . Ovipositor sheath yellow 1.5 mm long; piercer long and slender with smooth margin at apex, 2.3 mm long. Male genitalia as in Fig. 73. Epandrium brown, dorsal and lateral surfaces with numerous long brown setae. Surstyli short, gradually tapered from epandrium and truncate at apices. Proctiger moderately large with long setae ventrally.

Hosts: Manilkara bahamensis (Bak.) Lam. & Meeuse

Manilkara zapota (L.) Van Royen.

Distribution: Restricted to southern Florida

Florida Records: Monroe Co., Big Pine Key, 1♂, in McPhail trap, 19-UV-1935 (J. C. Bell, FSCA); 1♂, in McPhail trap, 29-IC-1935 (G. D. Barcus, FSCA) 1♀, in McPhail trap, 3-V-1935 (G. D. Barcus, FSCA); 2♀, in McPhail trap, 10-V-1935 (Barcus & Cruz, FSCA); 1♂, 1♀ in McPhail trap, 21-V-1935 (Barcus & Cruz, FSCA); 8♂ 3♀, in McPhail trap, 21-V-1935 (G. D. Barcus, FSCA); 1♂, in McPhail trap, 25-V-1935 (Barcus & Cruz, FSCA); 22♂ 12♀, fruit fly trap, 14-20-V-1935 (G. B. Merrill, USNM); 4♂ 2♀, trap, 24-28-V-1935 (J. F. Cooper, USNM); (paratypes) 4♂ 2♀, trap 24-28-V-1935 (J. F. Cooper USNM); Boca Chica Key, 1♂, in McPhail trap, 11-V-1935 (J. C. Bell, FSCA); (paratype) 1♀, fruit fly trap, 15-V-1935 (G. B. Merrill, USNM); Cudjoe Key, 1♂, in McPhail trap 9-V-1935 (J. C. Bell, FSCA); 1♀, in McPhail trap, 9-V-1935 (J. C. Bell, FSCA); 6♂ 1♀, in McPhail trap, 16-V-1935 (J. C. Bell, FSCA); 2♂ 2♀, in McPhail trap, 18-20-V-1935 (G. C. Bell, FSCA); (paratypes) 3♂ 3♀, fruit fly trap 20-V-1935 (G. B. Merrill, USNM); 1♀, 20-V-1935 (Bell & Moore, FSCA); Key Largo, 1♀, in McPhail trap 13-VII-1936 (Stirling & Barcus, FSCA); 1♂, in McPhail trap, 16-VII-1936 (G. D. Barcus, FSCA); Key West, 1♀, in McPhail trap, 19-I-1934 (J. H. Sealey, FSCA); 1♂, in McPhail trap, 25-IV-1934 (J. H. Sealey, FSCA); 1♀, in McPhail trap, 29-IV-1935, (Mendendez, FSCA); 1♂, in McPhail trap, 3-V-1935 (J. R. Lyle, FSCA), 1♀, in McPhail trap, 3-V-1935 (J. H. Sealey, FSCA); 1♀, in McPhail trap, 14-V-1935 (C. E. Shepard, FSCA); 1♀, fruit fly

trap, 1-VI-1960 (R. G. Milner, FSCA); Lower Matecumbe Key, 1♂, in McPhail trap, 24-V-1935 (A. S. Mason, FSCA); No Name Key, 15♂ 5♀, Mimusops emarginata, 3-VI-1933 (J. F. Copper, FSCA); 1♀, in McPhail trap, 13-V-1935 (Barcus & Cruz, FSCA); 3♂, in McPhail trap; 16-V-1935 (Barcus & Cruz, FSCA); 1♂ 2♀, reared from larva on Mimusops emarginata 18-V-1935 (J. F. Cooper, USNM); 1♀, in McPhail trap, 19-V-1935 (Barcus & Cruz, FSCA); 1♂ 1♀, in McPhail trap, 20-V-1935, G. D. Barcus, FSCA), 1♂ 2♀, in McPhail trap, 20-V-1935 (Barcus & Cruz, FSCA); (paratypes) 13♂ 3♀, Mimusops emarginata, 1-VI-1935 (J. F. Cooper, USNM); 1♀, in McPhail trap, 17-VII-1935 (Barcus & Moore, FSCA); 1♂ 2♀, Achras zapota, 26-II-1936 J. F. Coopers, FSCA); 1♂, Achras zapota, 7-II-1936 (J. F. Cooper, FSCA); Sugarloaf Key, 1♂, in McPhail trap, 16-V-1935 (J. C. Bell, FSCA); 1♂, in McPhail trap, 20-V-1935 (J. C. Bell, FSCA); Torch Key, 1♀, in McPhail trap, 21-V-1936 (J. C. Bell, FSCA).

Variation among the available specimen mainly involves the difference in the number of the lower fronto-orbital; most specimens have 5 pairs, but some have 6 pairs. Genitalia show some relationship to obliqua, but otherwise are distinct in many features. This species is restricted to the Florida Keys. It is not considered of economic importance and is rarely collected in traps. Not much is known about its biology, although adults have been reared several times from the fruits of Manilkara bahamensis and M. zapota.

Anastrepha obliqua (Macquart)
Figs. 18, 74, 123

Tephritis obliqua (Macquart) 1835, Dipteres. Tome deuxieme,
Diptera 2:703. Holotype ♀. Type locality: Cuba (Paris Museum).

Medium-sized yellow brown species differentiated by the generic characters in combination with the characters of the piercer and the prominent brown marking on the mesoscutum. Mesonotum yellow except for the brown marking over suture. With pleural stripe extending from behind the suture to posterior margin and the broad submedian stripe extending to posterior margin, broadens anteriorly reaching notopleuron the transverse suture. The bands of wing pattern yellow brown, Costal and S-band touching on vein R_{4+5} just anterior of r crossvein. V-band complete usually connected to S-band, often broadly, Ovipositor sheath brown 1.8 mm long. Piercer 1.5 mm long, moderately stout with base distinctly widened and acutely serrated at apical 2/3 or more. Male genitalia as in Fig. 74. Epandrium brown with numerous fine setae over the dorsum. Surstyli gradually tapers, apex rounded. Proctiger elongate, with numerous fine setae laterally with a clump of setae ventrally.

Length: body 6.1-7.4 mm; wing 6.0-7.2 mm. (N=10)

Host: Mangifera indica L.

Spondias guajava L.

Spondias mombin L.

Spondias purpurea L.

Syzygium jambos (L.) Alston

Distribution: Southern Texas, Florida.

Florida Records: Monroe Co.: Key West, 2♂ on Cuban Plum
 2-VI-1921 (L. R. Warner, FSCA); 1♀ at Margifera indica, 23-VI-1922
 (L. R. Warner, FSCA); 3♂ 2♀, reared from fruits, Spondias mombin,
 X-1932 (R. Hart, USNM); 1♂, at Spondias mombin, 19-X-1932 (J. W.
 Ludlam, FSCA); 1♀, 12-X-1932 (R. Hart, FSCA); 1♂, reared from Spondias
sp., 21-X-1932 (R. Hart, FSCA); 4♂ 3♀, on Spondias purpurea,
 21-X-1932 (Sealey, Ludlam & Merrill, FSCA); 4♂ 3♀, on Spondias mombin,
 21-24-X-1932 (J. W. Ludlam, FSCA) 1♂, at Annona squamosa, 24-X-1932
 J. W. Ludlam, FSCA); 2♂, swept Spondias mombin, 27-X-1932 (M. Kisliuk,
 FSCA); 1♂, XI-1932 (F. S. Blanton, FSCA); 1♂ 2♀, ex Psidium guajava,
 10-19-XI-1932 (McClanraan, FSCA); 9♂ 2♀, reared from guava,
 15-VII-1933 (L. C. McAlister, USNM); 3♂ 5♀, reared from Spondias
mombin, 1935 (J. F. Cooper, USNM); 2♂, in McPhail trap, 18-VII-1935
 (J. F. Cooper, FSCA); 1♂, in McPhail trap, 30-VII-1935 (L. A.
 Boagossa, FSCA); 1♂, in McPhail trap, 5-VIII-1935 (E. Solomon, FSCA);
 1♀, in McPhail trap, 9-IX-1935 (L. A. Bragossa, FSCA); 3♂ 1♀,
 in McPhail trap, 12-14-IX-1935 (L. A. Bragossa, FSCA); 3♂ 1♀, in
 McPhail trap, 17-19-IX-1935 (J. H. Sealey, FSCA); 1♂ 1♀, in McPhail
 trap, 26-IX-1935 (L. A. Bragossa, FSCA); 1♀, in McPhail trap,
 10-X-1935 (J. H. Sealey, FSCA); 2♂, in McPhail trap, 6-X-1935
 (J. F. Cooper, FSCA); 1♂, in McPhail trap, 10-X-1935 (J. F. Cooper,
 FSCA); 2♂ 1♀, in McPhail trap, 8-12-X-1935 (L. A. Bragossa, FSCA); 1♀
 in McPhail trap, 14-X-1935 (J. H. Sealey, FSCA); 1♀, in McPhail
 trap, 15-X-1935 (J. H. Sealey, FSCA); 2♂ 1♀, in McPhail trap,

18-X-1934 (L. S. Bragossa, FSCA); 1♂, in McPhail trap, 21-X-1935 (J. H. Sealey, FSCA); 1♂ 1♀, in McPhail trap, 22-X-1935 (J. H. Sealey, FSCA); 1♂, in McPhail trap, 25-XI-1935 (L. A. Bragossa, FSCA) 1♀, in McPhail trap, 1-XI-1935 (L. A. Bragossa, FSCA); 2♂, 7-XI-1935 (L. A. Bragossa, FSCA) ; 1♂, in McPhail trap, 16-I-1936 (J. F. Cooper, FSCA); 1♂, in McPhail trap, 9-II-1936 (J. F. Cooper, FSCA).

This species was first reported from Florida in the early 1930's. It is one of the 6 species of Anastrepha recorded as native to Florida. Although a major pest of mango in tropical countries, in Florida, it never has been positively associated with attacks on mango (Weems, 1970). The life history was discussed briefly by Weems (1970). A. obliqua resembles suspensa in wing pattern and serrations at the apex of piercer, but differs from it in lacking the pronounced median scutoscuteellar black spot typically present in suspensa.

Anastrepha ocrexia (Walker)
Figs. 19, 124

Trypeta ocrexia Walker, 1849, List Spec. Ins. Brit.
Mus. 4:1016. Holotype ♀. Type locality: Jamaica (MCZ).

Differing from other known Florida Anastrepha species by the wing markings (Fig. 19), by the palé yellow and black markings on the thorax and by having a banded abdomen. Thorax orange brown, with palé yellow and black markings. A brownish band on

scutoscuteellar suture, with a median black spot. Wing pattern predominantly dark brown. Costal and S-band connected in cell R_3 and part of cell R. Hyaline spot on costal not touching vein R_{4+5} . Proximal arm of V-band usually extending forward to vein R_{4+5} , but not connected to S-band. Distal arm of V-band short, either separated from proximal arm or jointed at vein M_{1+2} . Abdomen with transverse brown-black bands on tergites II-IV. Bands on tergites III and IV narrow or broken medially. Ovipositor sheath long and slender, 3.4 mm long. Piercer long and slender, apex gradually tapers to approximately 30 mm long. Male genitalia have not been dissected for study since males were not obtained in the course of this study.

Length: body 6.8-7.4 mm; wing 6.9-7.6 mm (N=3)

Hosts: Manilkara zapota (L.) Van Royen

Psidium guajava L.

Distribution: Florida, Cuba, Hispaniola, Jamaica.

Florida Record: Monroe Co.: Key Largo, 1♀, trap in sapodilla tree 3-VII-1936 (Barcus & Stirling, USNM).

This species has not been found in Florida since 1936, possibly because it has not survived in Florida, and possibly because of limited trapping in the Florida Keys. It is not considered to be of economic importance anywhere within its range. Nothings is known about the immature stages of this species. This species is distinctly different from other Florida Anastrepha because of its wing pattern and the banding on the tergites.

Anastrepha suspensa (Loew)

Figs. 20, 75, 125

Trypeta suspensa Loew, 1862, Smiths. Misc. Collect. 6(1): 69, pl. II, Fig. 5. Holotype σ . Type locality: Cuba (MCZ).

A moderately small, yellow-brown species characterized by having rather long patterned wing (Fig. 20), by having the apex of the piercer serrated, and by the median black spot on the thorax. Head shaped as in other members of the genus, with 2 pairs of upper fronto-orbitals and 5 pairs of lower fronto-orbital bristles. Thorax with a distinct scutoscuteellar spot. The wing bands, yellow-brown to brown. The costal and S-band touching or narrowly separated at vein R_{4+5} . V-band complete and usually narrowly connected to S-band. Entire abdomen densely yellow-brown setose. Ovipositor sheath 1.7 mm long, stout and tapering apically. The piercer 1.6 mm long, with widened base, the apex serrated and gradually tapers to a sharp point. Male genitalia as in Fig. 75. Epandrium yellow-brown with numerous long setae dorsally. Surstyli long and slender, rather pointed at apices. Proctiger small with numerous long setae ventrally.

Length: body 5.1-6.8 mm; wing 5.0-6.7 mm (N=15).

Hosts: Annona reticulata L

Annona squamosa L.

Bischofia javanica Blume

Averrhoa carambola L.

Capsicum frutescens L.

Carica papaya L.

Carissa grandiflora (E. H. Mey.) A. DC.

Casimiroa edulis Llave & Lex.

Chrysophyllum oliviforme L.

Citrofortunella mitis (Blanco) J. Igram & H. E. Moore

Citrus aurantium L

Citrus X paradisi Macfady

Citrus sinensis (L.) Osbeck

Citrus sp.

Clausena lansium (Lour.) Skeels.

Diospyros virginiana L.

Diospyros sp.

Dovyalis hebecarpa (G. Gardn.) Warb

Eriobotrya japonica (Thunb.) Lindl.

Eugenia brasiliensis Lam.

Eugenia ligustrina (Swartz) Willd.

Eugenia luschnathiana Klotzschex O. Berg.

Eugenia uniflora L.

Ficus carica L.

Flacourtia indica (Burm. F.) Merrill

Fortunella margarita (Lour.) Swingle

Fortunella sp.

Garcinia livingstonei T. Anderson

Litchi chinensis Sonn.

Lycopersicon esculentum Mill.

Malpighia glabra L.

Mangifera indica L.

Manilkara zapota (L.) Van Royen

Momordica balsamina L.

Murraya paniculata (L.) Jack

Persea americana Mill.

Pimenta dioica (L.) Merrill

Pouteria compechiana (HBK) Baehni

Prunus americana Marsh

Prunus persica (L.) Batsch.

Prunus sp.

Pseudanmomis umbellulifera Kausel

Psidium littorale var. longipes (), Berg.) Fosb.

Psidium freidrichsthallanum (O. Berg.) Niedenzu

Psidium quajava L.

Psidium sp.

Punica granatum L

Pyrus communis L

Pyrus X lecontei Rehd.

Rubus sp.

Severinia buxifolia (Poir.) Ten

Spondias purpurea L.

Synsepalum dulcificum (Schumach. & Thonn) Daniell

ex S. Bell

Syzygium jambos (L.) Alston

Syzygium samrangense (Blume) Merril & L. M. Perry

Terminalia catappa L.

Terminalia muelleri Benth.

Trevesia palmata (Roxb.) Vis.

Triphasia trifolia (Burm. f.) P. Wils.

Distribution: South Florida, Greater Antilles.

Florida Records. Broward Co.: 1♂, in McPhail trap,

10-11-1936 (C.D. Barcus, FSCA); Ft. Lauderdale, 1♂, in McPhail trap,

21-II-936 (G. D. Barcus, FSCA); Dade Co.: 1♀, 7-I-1937 (J. H. Sealey, FSCA); Homestead, 1♀, in McPhail trap, 8-I-1936 (J. W. Ludlam, FSCA); 1♀, in McPhail trap, 18-II-1936 (C. R. Roberts, FSCA) 2♂, reared from Syzygium samarangense, 31-X-1966 (Dowling, Jr., & Swanson, FSCA); Coconut Grove (Miami), 1♀, from trap in mulberry tree, 30-XII-1935 (Baker & Solomon, USNM); 1♂, reared from Mangifera indica, 18-VIII-1966 (R. W. Swanson, FSCA); Miami 2♂ 1♀, fruit fly trap, 1969 (USNM); Miami Beach, 5♂ 4♀, reared from grapefruit Citrus X paradisi, 31-X-1966 (D. De Haven, FSCA); 6♂ 5♀, reared from grapefruit, 4-XI-1966 (Don De Haven, FSCA); Desoto Co.: Arcadia, 1♀, in McPhail trap in Surinam, 22-VIII-1966 (G. P. Lamb, FSCA); Hendry Co.: La Belle, 2♂ 3♀, McPhail trap in Rangpur lime tree, 20-VIII-1966 (C. E. Nelson, FSCA); Highlands Co.: Avon Park, 1♂, citrus sp., 27-X-1969 (Ted Morris, FSCA); Lake Placid, 1♀, on foliage of cattley quava, 22-VIII-1966 (O. H. Baker, FSCA); Sebring, 1♂, Kumquat, 29-XI-1966 (Ted Morris, FSCA); Hillsborough Co.: Tampa, 2♀, in McPhail trap in grapefruit tree, 13-IX-1966 (Al Krause, FSCA); 1♀ Punica granatum, 21-X-1969 (C. W. Hale, FSCA); 1♀, in McPhail trap 9-II-1970 (A. L. Krause, FSCA); Indian River Co.: Vero Beach, 2♀, in McPhail trap in Carissa, 10-XI-1966 (R. H. Kendrick, FSCA); Lee Co.: Estero, 1♂, quava, Psidium quajava 31-XII-1965 (C. P. Schille, FSCA); Manatee Co.: Bradenton, 1♂, stickyboard trap in quava, 10-VIII-1966 (Doyle C. Chancey, FSCA); 7♀, in McPhail trap in quava tree, 28-X-1966 (D. C. Chancey, FSCA); 4♀, Steiner trap, 4-XI-1966 (D. E. Chancey, FSCA); 6♂ 4♀, in McPhail

trap in guava tree, 23-XI-1966 (D. C. Chancey, FSCA); 6♀, Steiner
 trap in guava tree, 2-XII-1966 (D. C. Chancey, FSCA); 7♀, Steiner
 trap, 16-XII-1966 (D. C. Chancey, FSCA); 30♂ 4♀, in McPhail trap
 in guava tree, 20-I-1967 (D. C. Chancey, FSCA); 4♀, in McPhail trap
 in guava tree, 27-I-1967 (D. C. Chancey, FSCA); Palmetto, 4♀, in
 McPhail trap in orange tree, 2-IX-1966 (C.J. Bickerner, FSCA);
 Monroe Co.: Big Pine Key, 3♂, in McPhail trap, 11-XII-1935 (H. K.
 Winter, FSCA); 8♂ 5♀, in McPhail trap, 16-XII-1935 (H. K. Winter,
 FSCA); 2♂ 5♀, in McPhail trap 21-XII-1935 (H. K. Winter, FSCA);
 Key West 1♀, in McPhail trap, 4-III-1932 (J. H. Sealey, FSCA);
 1♂ 1♀, at Psidium, 26-27-IX-1932 (R. Hart, FSCA); 1♂, 12-X-1932
 (FSCA); 2♂ 1♀, at Psidium, 18-X-1932 (M. Kisliuk, FSCA); 1♂ 1♀, at
Psidium, 20-X-1932 (M. Kisliuk, FSCA); 2♂, swept guava, 28-X-1932
 (M. Kisliuk & Ludlam, USNM); 1♂, 23-XI-1932 (FSCA); 2♂, in McPhail
 trap, 17-IV-1934 (J. H. Sealey, FSCA); 1♂ 2♀, in McPhail trap,
 20-21-IV-1934 (J. H. Sealey, FSCA); 1♂ 1♀, 23-IV-1930 (FSCA);
 1♂ 1♀, in McPhail trap, 25-IV-1934 (J. H. Sealey, FSCA); 2♀, in
 McPhail trap, 27-IV-1934 (J. H. Sealey, FSCA); 1♀, in McPhail trap,
 28-IX-1934 (J. H. Sealey, FSCA); 1♂, 30-IV-1934 (J. H. Sealey,
 FSCA); 1♀, in McPhail trap, 1♀, 2-V-1934 (J. H. Sealey, FSCA);
 2♀, in McPhail trap, 18-VI-1934 (J. H. Sealey, FSCA); 2♂, in
 McPhail trap, 20-VI-1934 (J. H. Sealey, FSCA); 1♂, in McPhail trap,
 3-VII-1934 (J. H. Sealey, FSCA); 1♂, in McPhail trap 25-VII-1934
 (J. H. Sealey, FSCA); 1♀, in McPhail trap, 18-II-1935 (E. Solomon,
 FSCA); 1♂ 2♀, in McPhail trap 18-17-II-1935 (A. Bragossa, FSCA);

1♂ 1♀, in McPhail trap 23-II-1935 (J. F. Cooper, FSCA); 1♀, in
 McPhail trap 20-II-1935 (A. Bragossa, FSCA); 1♀, in McPhail trap,
 25-II-1935, (A. Bragossa, FSCA); 3♂, in McPhail trap 26-II-1935
 (J. H. Sealey, FSCA); 1♀, in McPhail trap, 13-III-1935 (J. H.
 Sealey, FSCA); 4♀, in McPhail trap 13-14-III-1935 (J. H. Cooper,
 FSCA); 3♂ 1♀, in McPhail trap, 15-III-1935 (A. Bragossa, FSCA);
 2♂ 2♀, in McPhail trap, 16-III-1935 (A. Bragossa, FSCA); 1♂ 3♀,
 in McPhail trap, 15-16-III-1935 (J. H. Sealey, FSCA). 2♂ 2♀,
 in McPhail trap, 18-III-1935 (J. F. Cooper, FSCA); 5♂-2♀, in
 McPhail trap 19-III-1935 (J. H. Sealey, FSCA); 1♂ 3♀, in McPhail
 trap 18-19-III-1935 (A. Bragossa, FSCA); 2♂ 1♀, in McPhail trap,
 20-22-III-1935 (J. F. Cooper, FSCA); 1♀, in McPhail trap, 23-II-1935
 (J. H. Sealey, FSCA); 1♀, in McPhail trap, 22-VI-1935 (C. E. Shepard,
 FSCA); 1♂, in McPhail trap, 24-IV-1935 (W. R. Lyle, FSCA); 1♀, in
 McPhail trap, 26-II-1935 (J. H. Sealey, FSCA); 1♂, in McPhail trap,
 13-VII-1935 (J. F. Cooper, FSCA); 2♂ 5♀, in McPhail trap, 13-VII-
 1935 (A. Bragossa, FSCA); 2♂, in McPhail trap, 2♂, McPhail trap
 30-VII-1935 (E. Solomon, FSCA); 2♂ 2♀, in McPhail trap, 12-VII-
 1935 (J. H. Sealey, FSCA); 1♀, in McPhail trap, 22-VII-1935
 (J. H. Sealey, FSCA); 1♀, in McPhail, 22-VII-1935 (J. H. Sealey,
 FSCA); 3♂ 2♀, in McPhail trap, 30-VII-1935 (A. Bragossa, FSCA);
 1♀, in McPhail trap, 13-IX-1935 (J. H. Sealey, FSCA); 1♀, in
 McPhail trap, 8-X-1935 (A. Bragossa, FSCA); 1♀, in McPhail trap,
 21-X-1935 (J. H. Sealey, FSCA); 3♂ 1♀, quava thicket, 7-XII-1935
 (L. C. McAlister, FSCA); 1♂, in McPhail trap, 27-I-1936 (J. F.
 Cooper, FSCA); 1♀, in McPhail trap, 22-II-1936 (H. S. McClahan,

FSCA); 29-VI-1936 (H. H. Hume FSCA); 1[♀], 14-III-1936 (H. H. Hume, FSCA), 1[♀], in McPhail trap, 28-VII-1936 (Hume & Herring, FSCA) 1[♀], in McPhail trap, 3-VII-1936 (H. Hume, FSCA); 1[♂], in McPhail trap, 19-VII-1967 (J. I. Foder, FSCA); No Name Key, 2[♂] 2[♀], in McPhail trap, 28-XII-1936 (H. K. Winter, FSCA); 1[♀] in McPhail trap, 15-VI-1936 (R. B. Johnson, FSCA); 1[♀], in McPhail trap, 28-VI-1936 (R. F. Cooper, FSCA); Stock Island, 2[♀], blacklight trap, 4-VIII-1966 (F. A. Buchanan, FSCA); Okeechobee Co.: Okeechobee, 1[♀], stickyboard trap in orange tree, 13-X-1966 (Ted Morris, FSCA); 1[♂] 1[♀], sticky board trap in sour cherry tree, 1-XI-1966 (Ted Morris, FSCA); Orange Co., Winter Garden, 1[♂] in McPhail trap in grapefruit tree, 28-X-1966 (J. C. Grubbs, FSCA); Palm Beach Co.: Belle Glade, 1[♂], Rubus sp. "Brazo," 30-VI-1969 (W. E. Wyles, FSCA); 1[♂] Rubus sp. "Brazo" 3-VII-1969 (W. E. Wyles, FSCA); Boynton, 1[♂], in McPhail trap, 17-II-1936 (L. D. Link, FSCA); Pinellas Co.: St. Petersburg, 1[♂], in McPhail trap, 26-VIII-1966 (W. C. Carroll, FSCA); Polk Co.: Lake Wales, 1[♂] 1[♀], in McPhail trap in grapefruit tree, 13-XIII-1966 (W. M. Keen, FSCA), 2[♀], in McPhail trap in grapefruit tree, 9-XI-1966 (W. M. Keen, FSCA).

Of the 6 Anastrepha species, suspensa is the most common and is collected throughout the year. It is indigenous to the West Indies. It was first identified as occurring in Florida in 1931 (Weems, 1965, 1966). This species is considered a serious pest of commercial citrus, mangoes, and peaches in Florida, although within its normal range of distribution, the

economic damage caused by this species has been relatively small. More than 80 species of plants, including tomatoes and bell peppers, are hosts of the Caribbean fruit fly. An eradication program for suspensa in Key West was established by the State Plant Board of Florida and the USDA in 1933. Traps were used to evaluate the progress of the eradication effort. Thousands of specimens were collected from these traps in Florida over the years. There is no assurance that A. suspensa could not become a major pest of citrus or other crops such as peaches and apples, found in Florida or neighboring states. An extensive trapping program is still being carried out in parts of peninsula Florida for this species and other exotic fruit flies. Superficially, this species is difficult to distinguish from A. interrupta except for the ovipositor of the female and genitalia of the male.

Genus Ceratitis Macleay

Ceratitis Macleay, 1829, Zool. J. 4:482. Type species: citriperda Macleay = capitata (Wiedemann).

Members of this genus have distinctive patterns on the wings and mesonotum and a swollen scutellum. Head yellowish white, with 2 pairs of upper fronto-orbital bristles, borne on distinct tubercles in the males, and the anterior pair often modified into long spatula-shaped bristles. Two pairs of lower fronto-orbital bristles present. Mesonotum shining black or brown with yellow to white markings; with a large densely gray

pollinose and white to yellowish pilose area over the median portion. Dorsocentral bristles closer to a transverse line between supra-alar than a line between acrostichal bristles. Scutellum, swollen, shining black and with 2 pairs of strong scutellars. Wing short and broad with maculations on the basal portion. Median band yellow extending from costa to anal margin. An elongate brown spot extending along m crossvein. Abdomen yellow to dark brown with dark basal bands on tergites II-V.

Members of this genus are economically important. The world's most important and widespread citrus pest, the Mediterranean fruit fly, Ceratitidis capitata (Wiedemann) causes considerable economic losses wherever it occurs. The Natal fruit fly, Ceratitidis rosa Karsh, ranks next in importance to Mediterranean fruit fly in Africa. The larvae feed in fruits and vegetables. Studies of the biology of Ceratitidis capitata has been summarized in depth by Christenson and Foote (1960) and taxonomic reviews of the species have been published by Hardy (1949).

Ceratitidis capitata (Wiedemann)

Figs. 21, 76, 126

Trypeta capitata Wiedemann, 1824, *Analecta Entomol.*

4:55. Holotype ♀. Type locality: East Indies.

Rather small species. Head yellow, with 2 pairs of upper fronto-orbitals, the anterior pair in males always modified into long spatulate bristles, apex diamond shaped with fine longitudinal

striae. Mesonotum shining black with yellow to white marking along the suture at each side. Humeri yellow to whitish, each with a shining black spot at the base of bristle. Mesonotum densely gray pollinose, median portion with yellow to white pilose area. A median black vitta extends from anterior margin to about the suture. A pair of moderately large shining black spots in a line with notopleura. Pleurae yellow to white with black bristles. Scutellum swollen shining black except for a narrow, undulated yellow line across the base. Legs yellow. Wing broad, with characteristic maculations at the basal portion. A broad median yellow band extends vertically from costa through cell Cu_1 ending at vein $Cu_2 + 2nd\ A$. A brownish yellow costal band extends through cell R_1 , middle of cell R_3 to apex of vein R_{4+5} . Vein R_{4+5} with a dark spot about the middle of cell R_5 . An elongate brown spot along m crossvein. Ovipositor sheath yellow, tinged with brown at apex, about 0.9 mm long. Piercer sharp pointed at apex, about 0.9 mm long. Extended ovipositor 2.5 mm long. Male genitalia as in Fig. 76. Epandrium broad and yellow with numerous long dark brown setae dorsally. Surstyli short, and extended into slender apical lobes. Proctiger with scattered setae lateroventrally.

Length: body 5.6-6.0 mm; wing 4.8-5.5 mm. (N=15).

Host: Citrofortunella mitis (Blanco) J. Ingram & H. E. Moore

Psidium littorale var. longipes (O. Berg.) Fosb.

Syzygium jambos (L.) Alston.

Distribution: Hawaii, Florida. However, this species has been eradicated from Florida in 1963.

Florida Records: Broward Co.: Ft. Lauderdale, 1♂ 16-VII-1962 (W. Wolski, FSCA), 1♀, in Steiner trap, 21-VII-1962 (W. Wolski, FSCA); 1♀, 16-I-1963 (H. A. Denmark, FSCA); Lauderdale-by-the-Sea. 1♀, Steiner trap in calamondin, 11-I-1963 (M. O'Brien, FSCA); 1♀, Steiner trap, 4-II-1963 (G. F. Spencer, FSCA); West Hollywood, 13♂ 12♀, Angelican seed oil trap, 10-VII-1956 (USNM); 2♂ 1♀, in Steiner trap, 26-VI-1962 (B. Lake, FSCA); Dade Co.: 3♂, 19-IV-1956 (H. A. Denmark, USNM); 10♂ 4♀, 19-IV-1956 (H. A. Denmark, FSCA). 4♂, 20-IV-1956 (H. A. Denmark, FSCA); 4♂ 1♀, 30-IV-1956 (H. A. Denmark, FSCA); Coral Gables, 1♀, in Steiner trap, 12-VI-1962 (J. E. Hibbard, FSCA); Hialeah, 1♂, on rose apple, 17-VI-1962 (R. D. Williams & H. L. Gillis, FSCA); 2♂, reared from Ceylon peach, 3-VII-1962 (L. P. Lucas, FSCA); Miami, 10♂ 12♀, Angelica seed oil trap, 5-8-VII-1956 (R. H. Foote, USNM); 165♂ 25♀, in McPhail trap, 23-V-1956 (H. A. Denmark, FSCA); 1♂, in Steiner trap, 8-VI-1962 (W. S. Brewton, USNM); 2♂ 1♀, rose apple, 13-VI-1962 (R. T. McMillan & J. R. McFarlin, FSCA); 1♂ 1♀, mango tree, 13-VI-1962 (R. T. McMillan & J. R. McFarlin, FSCA); 1♂, rose apple, 13-VI-1962 (R. T. McMillan & J. R. McFarlin, FSCA); 1♀, Steiner trap, 16-VI-1962 (J. E. Hibbard, FSCA), 1♀, in Steiner trap, 16-VI-1962 (R. E. Woodruff, FSCA); 1♂, in Steiner trap, 18-VI-1962 (W. S. Brewton, FSCA); 1♂, 19-VI-1962 (J. E. Hibbard, FSCA); 1♂ 1♀, in Steiner trap, 23-VI-1962 (C. R. Roberts &

W. S. Brewton, FSCA); 1♂ 2♀, in Steiner trap, 24-VI-1962 (R. Kendrick & J. Luger, FSCA); 1♂ 1♀, in Steiner trap, 26-VI-1962 (W. S. Brewton, FSCA); 3♂, in Steiner trap, 26-VI-1962 (W. S. Brewton & G. R. Seales, FSCA); 1♀, in Steiner trap, 28-VI-1962 (R. F. Patterson & D. E. Read, FSCA); 1♂, 5-VII-1962 (W. S. Brewton, FSCA); 1♂, trap in calamondin, 7-VII-1962 (J. Madison, FSCA); 1♂, trap in calamondin, 12-VII-1962 (F. E. Brundage, FSCA); 1♂, 14-VII-1962 (J. Madison, FSCA); 1♀, Steiner trap or guava tree, 17-VI-1963 (L. H. Sherron, FSCA); 1♀, Steiner trap in calamondin, 15-VII-1963 (L. H. Sherron, FSCA); 1♀, Steiner trap in mango, 15-VII-1963 (H. Creamer, FSCA); 1♂, in Steiner trap, 22-VI-1962 (R. B. Rubin & B. D. Pate, FSCA); Miami Spring, 1♂, in Steiner trap, 19-VI-1962 (W. M. Keen & R. W. Davis, FSCA); 20♂ 12♀, Angelical seed oil trap in old orchard, 26-VI-1956 (R. P. Burke, USNM); North Miami, 1♂ 1♀, Steiner trap, 16-VI-1962 (J. Pott, FSCA); 1♀ 5-VII-1962 (R. C. Page, FSCA); 1♂, 5-VIII-1962 (W. W. Burtless, FSCA); 2♂, 5-VIII-1962 (Read and Patterson, FSCA); Perrine, 1♂ 1♀, in Steiner trap, 28-VI-1962 (G. T. Smith & J. P. Sharrer, FSCA); Monroe Co.: Key Biscayne, 1♀, in Steiner trap, 27-VI-1962 (J. Madison, FSCA); Orange Co.: Orlando, 3♂ 1♀, 1929 (USNM); 8♂ 6♀, IV-1929 (USNM); 1♂ 1♀, 9-IV-1929, (USNM); (W. W. Yothers & C. B. Keck, USNM); 3♂ 2♀, 15-IV-1929 (J. C. Goodwin, FSCA), 5♂ 2♀, 10-V-1929 (F. S. Blanton, CU); 2♂, 13-V-1929 (F. H. Dillingses, USNM).

This species was introduced into Florida several times and outbreaks of this fly, in 1929, 1956, and again in 1962

threatened the commercial citrus growing in the state (Ayers, 1957; Ayers & Rohwer, 1956; and Weems, 1962). Trapping played an important part in detecting and surveying for these flies during the eradication program. Several studies of the lures for these flies were carried out (Rohwer, 1958; Simanton, 1958; Steiner et al., 1957 and 1961). The traps caught hundreds of thousands of these flies over the years. The co-operative effort of many agencies, the effective trapping methods and spray programs contributed to the success of the eradication program of the Mediterranean fruit fly in Florida.

C. capitata may be readily recognized by the distinctive markings on the thorax and wing. Hardy (1949) and Weems (1962) have reviewed the taxonomy and gave some details on their biology. At least 100 species of fruiting plants have been recorded as host of the Mediterranean fruit fly (Back & Pemberton, 1918).

Genus Dioxyna Frey

Dioxyna Frey, 1944, Comment. Biol. 8(10): 62. Type species: Trypeta sorocula Wiedemann.

Closely resembles Paroxyna Hendel, readily differentiated from other tephritids which have 2 pairs scutellar bristles by the elongated head, distinctly longer than high and by the absence of preadeagal setae. Head bristles black, vertex as broad as maximum width of eye, frons flat; proboscis geniculate, labellum long and slender, 2 pairs of upper fronto-orbitals, the posterior

pair pale and scale-like; 2 pairs of lower fronto-orbitals. Ground color of thorax, black, dorsum densely gray pollinose; dorsocentral bristles close to transverse suture; 1 pair of scutellar bristles. Legs yellow, except for a tinge of brown to black on femur in some species; wing with numerous hyaline spots similar to that of Paroxyna, but differs by having the stigma without a subhyaline spot. Abdominal terga, dark brown to black, densely covered with white scale-like setae.

Larvae of Dioxyna inhabit flower heads of various composites. Many species of Bidens are host plants. The immature stages of the members of this genus in Florida have been described by Benjamin (1934) and Phillips (1946).

This genus is represented by only 2 species in North America. Munro (1957) reviewed the genus and described additional species. Members of this genus are closely related to Paroxyna. Early workers (Curran, 1934; Benjamin, 1934) included the Nearctic species in the genus Paroxyna. Novak (1974) revised these 2 genera and clarified their taxonomic status.

Key to the Florida Species of Dioxyna

1. Legs with basal 1/2 of all femora blackish; wing with subhyaline spot restricted to cell R5 (Fig. 22); male epandrium highly arched with scattered long setae (Fig. 77); surstyli elongated; apex pointed. picciola (Bigot)

1'. Legs with basal $1/2$ of all femora yellowish; wing with subhyaline spot on cell R_3 and R_5 (Fig. 23); male epandrium robust, with dense thick setae (Fig. 78); surstyli broad and blunt. thomae (Curran)

Dioxyna picciola (Bigot)

Figs. 22, 77, 127

Acinia picciola Bigot, 1857, in Sagra, Hist. Fis. Pol. and Nat. Cuba, 2nd part, Hist., Nat., 1856, 7:347. Type (sex not known). Type locality: Cuba.

A very common, widespread, easily recognized species characterized by having the basal $1/2$ of all femora dark brown. Scutellum with only 2 long black bristles. Head elongate with epistoma and sides of face protruded; proboscis elongate and geniculate. Wing markings as given in the key (Fig. 22). Female ovipositor long, about 2 mm; the ovipositor sheath black, approximately equal in length to the piercer, being 0.8 mm and 0.7 mm long respectively; piercer long, apex gradually tapered into sharp point. Male genitalia small and compact; epandrium highly arched, surstyli elongate and pointed inward; proctiger elongate with numerous scattered setae.

Length body: 2.5-3.6 mm; wing 2.4-2.7 mm (N=15).

Hosts: Baldiuna angustifolia (Pursh) Robinson

Bidens bipinnata L.

Bidens laevis (L.) BSP

Bidens mitis (Michx.) Sherff.

Bidens pilosa L.

Bidens pilosa var. radiata Schultz-Bip.

Carduus carolinianus Watt.

Coreopsis leavenworthii T & G.

Coreopsis nudata Nutt.

Coreopsis tinctoria Nutt.

Coreopsis tripteris L.

Cosmos sp.

Helenium flexuosum Raf.

Tagetes erecta L.

Distribution: Throughout United States (except for upper New England States) Alberta, Manitoba, Saskatchewan, Mexico, and Central America.

Florida Records: Alachua Co.: 2♂, on Prunus angustifolius 17-II-1956 (H. V. Weems, Jr., CU); 1♂ 1♀, on Melilotus alba; 5-III-1956 (R. A. Morse, CO); 2♂ 1♀, on Erigeron quercifolius, 2-V-1956 (R. A. Morse, CO); 1♂, on Erigeron quercifolius, 2-VII-1956 (R. A. Morse, CU); Gainesville, 1♂, 28-X-1981 (P. W. Fattig, USA); 2♂ 1♀, reared from Bidens pilosa, 14-VII-1930 (D. J. Nicholson, USNM); 5♂ 6♀, on Bidens pilosa, 31-X-1956 (R. A. Morse, CU), 1♂ 1♀, on Bidens pilosa, 11-XI-1956 (R. A. Morse, AMNH); 1♂ 3♀, on Bidens pilosa 11-XI-1956 (R. A. Morse, CU); 2♂ 1♀, on Lupinus angustifolius, 30-I-1957 (F. S. Mead, FSCA); 1♂ 1♀, 24-VIII-1957 (H. V. Weems, Jr., CU); 2♂, 4-XI-1958 (R. W. Woodruff, FSCA); 1♀, 18-X-1960 (F. W. Mead, FSCA); 2♂ 1♀, 1-XII-1963 (F. W. Mead, FSCA); 6♂ 4♀, on Madicago sativa, 2-I-1964 (F. W. Mead, FSCA); 2♂, on Prunus angustifolius

20-II-1966 (H. V. Weems, FSCA); 2♂ 6♀, insect flight, 29-X-1971
 (H. V. Weems, Jr., FSCA); 2♂ 3♀, reared from Bidens pilosa, 14-V-1978
 (I. B. Rohani, FSCA); 2♂ 3♀, reared from Bidens pilosa, 12.VII-1978
 I. B. Rohani, FSCA) 9♂ 6♀, reared from Bidens pilosa 17-VII-1978
 (I. B. Rohani, FSCA); 8♂ 3♀, reared from Bidens pilosa 23-VIII-1978
 (I. B. Rohani, FSCA); 4♂ 2♀, reared from Bidens pilosa 24-VIII-1978
 (I. B. Rohani, FSCA); Brevard Co.: Bonoventure, 10♂ 9♀, reared
 from Bidens pilosa, 25-V-1930 (C. F. Benjamin, USNM); 9♂ 6♀, reared
 from Bidens pilosa, 29-30-V-1930 (C. R. Benjamin, USNM); 20♂ 10♀,
 reared from Bidens pilosa, 2-17-VI-1930 (C. F. Benjamin, USNM): Indian
 River City, 2♂ 1♀, reared from Bidens pilosa (D. J. Nicholson, USNM);
 Charlotte Co.: Andytown; 1♂, on Bidens pilosa, 30-III-1966 (H. V. Weems, Jr.
 FSCA); Citrus Co.: Crystal River, 8♂ 7♀, reared from Coreopsis
leavenworthii, 31-X-1930 (D. J. Nicholson, USNM); Homosassa Spring,
 9♂ 4♀, reared from Coreopsis leavenworthii, 3-4-XI-1930 (D. J. Nicholson,
 USNM; Inverness, 9♂ 1♀, reared from Bidens pilosa, 31-X-1930
 (D. J. Nicholson, USNM); Dade Co.: Hialeah, 5♂ 4♀, ex flower head.
Bidens pilosa, 19-25-I-1971 (C. Stemaier, USNM); 2-V-1967, (P. V.
 Peterson, CNC); 3♂ 1♀, swept weeds, 21-VI-1967 (R. A. Morse, FSCA);
 Matheson Hammock, 12♂ 5♀, on Bidens pilosa, 31-III-1966 (H. V. Weems,
 FSCA), Miami, 1♀, 19-IV-1964 (O. R. Paulson, FSCA), 6♂ 6♀, 17-18-V-
 1924 (S. Graenicher, CNC); 2♂, on Citrus sp., 9-V-1932 (O. C. Link,
 CU); 1♂, on Citrus X paradisi, 24-II-1932 (O. D. Link, CU); Miami
 spring; 1♂ 2♀, 17-IX-1948 (O. C. Link, CU); 1♂, 17-I-1948 L. S.
 Light, Jr., FSCA); Duval Co.: Fort George, 1♂, 19-IX-1965

(C. F. Zeiger, FSCA) Jacksonville, 2♂ 2♀, 30-X-1963 (C. F. Zeiger, FSCA); 1♂ 3♀, 14-XI-1965 (C. F. Zeiger, FSCA). Gadsden, Co.: 1♀, 1-VIII-1956 (F. W. Mead, CU); Glades Co.: 2♂, swept weeds, 6-XII-1955 (R. A. Morse, FSCA); 1♂ 2♀, swept weeds, 6-VII-1955 (R. A. Morse, CU); 2♀, swept weeds, 6-XII-1955 (R. A. Morse, AMNH); Hernandó Co., 4♀, Bidens pilosa, 3-X-1956 (R. A. Morse, CU); Archbold Biol. Sta. 1♂ 1♀, 20-VI-1973 (C. R. Miller, CU); 5♂ 10♀, 24-IV-1967 (B. V. Peterson, CNC); Sebring, 2♂ 1♀, 25-XI-1954 (H. V. Weems, Jr., CU); 10♂ 5♀, reared from Bidens pilosa, 22-III-1978 (T. B. Rohani, FSCA). Hillsborough Co., Tampa, 1♂ 1♀, reared from Bidens pilosa, 23-III-1930 (Pope & White, USNM); 1♀, Bidens pilosa, 17-IV-1930 (D. J. Nicholson, USNM); 3♂ 1♀, Bidens pilosa, 21-IV-1930 (D. J. Nicholson, USNM); Holmes Co.; Bonifay, 2♂ 1♀, reared from Coreopsis nudata, 2-VI-1930 (D. J. Nicholson, USNM); Indian River Co., Sebastian, 2♀, Bidens pilosa, 24-III-1930 (Conner, USNM); Lake Co.; 1♂, 14-VI-1955 (F. W. Mead, FSCA), 1♀, 9-IV-1956 (R. A. Morse, CU); Leesburg, 60♂ 40♀, bred from Bidens pilosa, 19-26-VI-1930 (E. T. Evans, UNSM); Lee Co.; Pine-land, 4♂ 2♀, 27-IV-1967 (B. V. Peterson, CNC); Sanibell Is. 3♂ 3♀, insect flight trap, 11-V-1973 (W. W. Wirth, USNM); Levy Co.; Cedar Key, 34♂ 17♀, bred from Bidens pilosa, 28-31-X-1930 (D. J. Nicholson, USNM); Manatee Co., Bradenton, 2♂, on flower of Aster, 17-X-1970 (H. R. Dodge, FSCA); 1♂ 2♀, on flower of Solidago stricta, 6-I-1971 (H. R. Dodge, FSCA); Marion Co.: 2♂, at Rubus 4-IV-1959 (H. V. Weems, Jr., FSCA); Belleview, 2♂ 3♀, bred from

Bidens pilosa 12-VII-1930 (D. J. Nicholson, USNM); McIntosh, 10♂
 15♀, reared from Bidens pilosa 30-VIII-1978 (I. B. Rohani, FSCA);
 Ocala, 4♂ 16♀, reared from Bidens laevis, 23-XI-1929 (F. Walker,
 USNM); 4♂ 3♀, swept weeds Bidens pilosa, 30-VIII-1978 (I. B.
 Rohani, FSCA); Wiersdale, 5♂ 3♀, bred from Bidens pilosa, 12-VII-
 1930 (D. J. Nicholson, USNM); Martin Co.: Indiantown, 9♂ 8♀
Bidens pilosa 17-II-1930 (Beavers, USNM) Monroe Co., Big Pine
 Key, 2♂, swept weeds, 28-XII-1971 (W. H. Price, FSCA); 7♂ 6♀
 reared from Cordius carolinianus, 24-30-III-1978 (I. B. Rohani,
 FSCA); Boca Chica, 5♂ 1♀, swept roadside weeds, 8-V-1971 (W. H.
 Pierce, FSCA); Everglades Nat'l Park, 2♂, 30-XI-1961 (Munroe,
 Glen, Holland & Chillcot, CNC); 1♂, 1-XII-1961 (Munroe, Glen Holland
 & Chillcot, CNC); 4♂ 8♀, Bidens pilosa, 7-V-1967 (B. V. Peterson,
 CNC); 4♂, on flower of solidago stricta, 5-XII-1970 (H. R. Dodge,
 FSCA); 2♀ 28-29-III-1978 (C. L. Smith, UGA); Key Largo, 1♀,
 26-XII-1956 (Camilla Weems, CU); 3♂ 1♀ 9-10-IV-1955 (F. W. Mead,
 FSCA); 3♂ 1♀, M₂ Light, 5-6-XII-1961 (Munroe, Holland, & Chillcot,
 CNC); 29♂ 17♀, swept Bidens pilosa, 24-III-1978 (Y. Salleh & I. B.
 Rohani, FSCA); Key West; 16♂ 10♀, 18-24-III-1930, bred from Bidens
pilosa (USNM); 4♂ 1♀, taken at light 26-III-1935 (E. G. Hume, CU);
 3♂, on Flaveria linearis 27-VII-1952 (H. V. Weems, Jr., FSCA);
 1♂ 1♀, 9-V-1967 (B. V. Peterson, CNC) 2♂, 2-II-1969 (USNM); Saddle
 bunch Keys, 1♀, on Flaveria linearis, 29-XII-1953 (H. V. Weems, Jr.,
 CU); 3♂ 1♀, on Flaveria linearis, 29-XII-1959 (H. V. Weems, Jr.,
 ANMH); Okaloosa Co., Eglin Home, 4♂ 3♀, on daisy-like composite,
 25-IX-1966 (P. A. Thornas, FSCA); Orange Co.; Apopka, 18♂ 12♀,

bred from Bidens pilosa, 21-24-VI-1930 (E. T. Evans, USNM); Orlando, 3♂ 3♀, bred from Bidens pilosa 4-XI-1929 (D. J. Nicholson; USNM); 12♂ 6♀, bred from Bidens coronata, 20-26-XI-1929 (F. H. Benjamin, USNM); Winter Garden, 7♂ 4♀, bred from Bidens laevis, 30-XII-1930; 2-I-1931 (D. J. Nicholson, USNM); Osceola Co.: East Lake 5♂ 3♀, Bidens pilosa 23-24-VI-1930 (D. J. Nicholson, USNM); Palm Beach Co.: West Palm Beach, 4♂, 18-IX-1942 (D. E. Hardy, USNM); Pasco Co., Zephyr Hill, 3♂ 4♀, swept Bidens pilosa 13-VI-1976 (R. A. Belmont, FSCA); Putnam Co. 2♂, sweeping grass 28-IV-1954 (H. A. Denmark, AMNH); Sarasota Co.: Nokomis, 2♂, 10-V-1960 (P. E. Woodruff, FSCA); Sarasota, 6♂ 4♀, swept Bidens clumps, 12-13-II-1946 (J. G. Needham, FSCA); Seminole Co.: Lake Munroe, 2♂ 2♀, bred from Bidens pilosa, 3-7-VII-1930 (A. B. Beavens, FSCA).

Large numbers of specimen have been seen and collected from many localities in Florida. Benjamin (1934) described the immature stages. This is the most common tephritid reared from Bidens.

Dioxyna thomae
Figs. 23, 78, 128

Ensina thomae Curran, 1928, N.Y. Acad. Sci. 11:70. Holotype

♀. Type locality: St. Thomas, Virgin Islands.

Superficially resembling picciola (Bigot) but differs by having all the femora yellowish, wing with subhyaline spots on cell R₃ and R₅. Thorax and abdomen black, dorsum densely gray pollinose. Female ovipositor much longer than picciola, about 3.4 mm;

ovipositor sheath dark brown to black approximately 1.0 mm long; the piercer very long, slender, gradually tapered into an elongate sharp point, about 0.7 mm in length. Male genitalia with a large robust epandrium; dorsum of epandrium with dense thick setae, surstyli broad and blunt, more or less rounded at apex, proctiger, small with scattered setae.

Length: body, 2.0-4.0 mm; wing 2.8-3.0 mm. (N=10).

Hosts: Bidens bipinnata L.

Distribution: Florida, Bermuda, Virgin Island (St. Thomas Island), and West Indies.

Florida Records. Alachua Co.: 1♂ 1♀, 20-XII-1951 Gainesville, 1♂ 1♀, Blacklight trap, 3-X-1972 (F. W. Mead, FSCA); 2♀, 11-X-1972 (H. R. Dodge, FSCA); 1♂, insect flight trap, 19-2I-X-1973 (H. V. Weems, Jr., FSCA); 2♀, insect flight trap, 24-X-1973 (H. V. Weems, Jr., FSCA), 1♂ 1♀, insect flight trap, 1-6-XII-1973 (H. V. Weems, Jr., FSCA); Citrus Co.: Crystal River, 25♂ 56♀, bred from Bidens bipinnata, 3-XI-1930 (D. J. Nicholeson, USNM); Martin Co.: Waveland, 4♂ 8♀, 13-V-1937 (O. D. Link, FSCA), Orange Co.: Orlando 15♂ 13♀, bred from Bidens bipinnata, 8-X-1930 (D. J. Nicholson, USNM); 5♂ 7♀, bred from Bidens bipinnata, 11-X-1930 (D. J. Nicholson, USNM); 46♂ 44♀, bred from Bidens bipinnata, 13-X-1930 (D. J. Nicholson, USNM); Ocala Co.: East Lake, 22♂ 45♀, bred from Bidens bipinnata, 23-26-VI-1930 (E. T. Evans, USNM); Seminole Co.: Oviedo, 4♂ 6♀, bred from Bidens bipinnata, 1-5-VIII-1930 (D. J. Nicholson, USNM).

The Nearctic distribution of D. thomae is restricted to Florida and Bermuda. Its distribution in Florida is not widespread

as picciola presumably because it is associated with only one host, Bidens bipinnata. According to Benjamin (1934), on the basis of current information, the immature stages of thomae cannot be differentiated from those of picciola.

Genus Dyseuaresta Hendel

Dyseuaresta Hendel, 1928, Entomol. Mitt. 17:368. Type species: Euaresta adelphica Hendel.

Closely resembles Euaresta, but differs by having only 1 pair of scutellars, the epandrium simple, without any striation and the femora of males unmodified. Head slightly higher than long; face gently concave as seen laterally. Arista long and plumose. Antennae yellow, 3rd segment rounded at apex. Only 2 pairs of upper fronto-orbital bristles, the posterior pair pale, scale-like; 2 pairs of lower fronto-orbital bristles. Thorax largely black with grayish pollinose. Dorsocentral bristles near transverse suture and in front of a line between anterior supra-alars. Legs entirely yellow, normal. Wing typically dark with discal and marginal hyaline spots. Abdomen dark brown to black with short setae.

Not much is known about the biology of the species, but like members of Euaresta, they develop in the flower heads and ovaries of Compositae. The genus appears to be neotropical in origin, with about 10 species. Only 1 species occurs in North America.

Dyseuaresta mexicana (Wiedemann)

Figs. 24, 79, 129

Trypeta mexicana Wiedemann, 1930, Auss. Zweifl. Ins.,

2:684. Holotype ♀. Type locality: Mexico.

Readily differentiated by its dark brown to black body and by the wing marking as in Fig. 24. Wing with many discal and marginal hyaline spots on a dark background. Vein R_{4+5} bare or sparsely setose. Cell R_5 with a faint bulla. Middle 1/2 of cell Cu_1 with large hyaline area. Female ovipositor long, about 3.7 mm. The ovipositor sheath black with numerous black setae, 1.4 mm long. The piercer strong, evenly tapered to a long narrow tip at the apex, measures approximately 1.2 mm long. Male genitalia as in Fig. 79. Epandrium wide and black dorsum with a few long setae. Surstyli long, slender, and heavily curved inward, apices truncata. Proctiger small and elongate, with long fine setae ventrally.

Length: body 3.0-4.0 mm; wing 2.5-3.2 mm. (N=10).

Hosts: Melanthera aspera Jacq. var. grabiuscula (Kuntze)

Parks

Melanthera nivea (L.) SmallMelanthera parviflora SmallMelanthera sp.

Distribution: Arizona, Texas, Florida, and West Indies, Mexico.

Florida Records: Brevard Co.: Rockledge, 2♂, ex Melanthera nivea, 6-III-1930 (C. F. Benjamin, USNM); 2♂ 1♀, reared from Melanthera.

sp., 21-22-X-1930 (Connors, USNM); 1♀ reared from Melanthera nivea 29-V-1930 (Benjamin, USNM); Collier Co.: 2♀, 1-XII-1955 (H. V. Weems, Jr., FSCA); Levy Co.: Williston, 6♂, bred from Melanthera nivea, 9-10-XI-1930 (D. J. Nicholson, USNM); Monroe Co.: Bahia Honda Key, 1♀, tidal flat, 10-IV-1966 (D. H. Habeck, FSCA); Big Pine Key, 1♂, 30-XII-1957 (H. V. Weems, Jr., FSCA); Boca Chica Key, 1♂ 3♀, 16-I-1972 (W. H. Pierce, FSCA); Cape Sable, 4♂ 2♀, 21-III-1953 (W. R. M. Mason, CNC); Everglades Nat'l Pk., 1♀, 20-X-1954 (H. V. Weems, Jr., FSCA); Grassy Key, 1♂, 3-IV-1966 (H. V. Weems, Jr., FSCA); Key Largo, 1♂, 26-XII-1954 (H. V. Weems, Jr., FSCA); 1♂ 26-XII-1956 (H. V. Weems, Jr., FSCA); 1♂, 26-XII-1956 (H. V. Weems, Jr., FSCA); Loggerhead Key, 1♂ 1♀, 15-17-III-1973 (R. Thorington & J. Layne, USNM); Middle Cape Sable; 2♂ 1+, 7-IV-1966 (H. V. Weems, Jr., FSCA); Plantation Key, 3♂, 27-XI-1955 (H. V. Weems, Jr., FSCA); Stock Is., 1♂, 9-I-1972 (W. H. Pierce, FSCA). Palm Beach Co.: West Palm Beach, 1♂, 15-I-1957 (H. G. Dyar, USNM).

The wing pattern is similar to that of Euaresta bella (Loew), but it is easily differentiated by the presence of only 2 hyaline areas in cell R_1 . Larvae infest flower heads of certain composite plants. Stegmaier (1968a) studied the life history of the species.

Genus Euleia Walker

Euleia Walker, 1836, Entomol. Mag. 3 (art 5): 81. Type species
Musca onopordinis Fabricius = Euleia heraclei (Linnaeus).

Predominantly a yellow to brown species; readily differentiated from other Trypetinae by its distinctive wing pattern (Fig.). All head and body bristles strong, shining black. Head with 3 pairs of lower fronto-orbitals; 2 pairs of upper fronto-orbitals, the posterior pair reclinate, never convergent. Dorso-central bristles in a line drawn between the anterior supra-alars, 2 pairs of scutellar bristles Metathorax with paired dark areas. Distal 3rd of cell 1st M_2 with 3 large hyaline area, middle of cell R with a light spot.

Of the 2 species known from North America 1 occurs in Florida This genus was reviewed by Foote (1959). The differences between the North American member of this genus and the closely related European species were discussed.

Euleia fratria (Loew)
 Figs. 25, 80, 130 .

Trypeta fratria Loew, 1862, Smiths. Misc. Collect., 6(1): 67, pl. 14f, Fig. 4. Holotype ♂. Type locality: United States (MCZ).

Readily differentiated from other Euleia by its striking wing pattern, especially on the outer 1/3 of the wing disc (Fig. 25)

the posterior dark band ending at margin of 2nd M_2 complete. Face slightly receding, oral margin not produced forward; proboscis short. Ovipositor short and broad, about 1.8 mm long. The ovipositor sheath yellow tinged with brown, 0.7 mm long. Piercer very short; about 0.5 mm long; apex of piercer gradually tapering to a sharp point. Male genitalia longer than width; epandrium yellow, with scattered long pale setae. Surstyli very long and slender, curved upward, and slightly pointed apically, at an angle to each other. Proctiger elongated, project outward, pale yellow with long pale setae scattered over its surface.

Length: body 3.4-3.7 mm; wing 3.2-3.5 mm (N=8).

Hosts: No host information for Florida specimens. Known hosts for E. fratria are

Pastinaca sativa Linnaeus

Heracleum sphodyllium L. subspecies montanum

(Scheich. ex Gaudin) Briq.

Cryptotaenia canadensis (L.) DC.

Distribution: eastern Canada, northern 1/2 of the United States, and Florida.

Florida Records: Alachua Co.: Gainesville, 3♂ 1♀, insect flight trap, 9-V-1973 (W.W.Wirth, USNM); Duval Co.: Jacksonville, 1♂, 8-VI-1963 (C.F.Zeiger, FSCA); Volusia Co.: Oak Hill, 1♂, stickyboard trap in grapefruit, 3-IV-1969 (J.N.Pott, FSCA); Port Orange, 1♂, McPhail trap, 30-III-1968 (J.N.Pott, FSCA).

This species is known as the parsnip leaf-miner and is closely related to E. heraclei, a European species, widely known as the celery fly. The differences between these 2 species were discussed by Foote (1959). Bank (1912) gave a short taxonomic description of the larvae. Foote and Blanc (1963), in their bulletin on the Tephritidae of California, have compiled a list of E. fratria hosts. The bionomics of this species were studied in detail by Tauber and Toschi (1965a).

Genus Euaresta Loew

Euaresta Loew, 1873, Smiths. Inst. Misc. Collect. 11

(256):296. Type species: Trypeta festiva Loew.

Small to medium-sized yellow to black flies with many discal and marginal hyaline spots on the wing. Head with vertex broader than maximum width of the eyes, with 2 pairs of lower and upper fronto-orbitals. Ground color of thorax yellow to black. Dorsocentrals near the transverse suture and in front of a transverse line through supra-alars; 2 pairs of scutellar bristles. Males with swollen fore femur and with distinct striation on the epandrium of genitalia.

The biology and habits of Euaresta are unknown. The genus is widespread in North America, with 2 of the 8 Nearctic species occurring in Florida. Foote and Blanc (1963) discussed briefly the 5 California species. The most recent revision of this genus is that of Quinsberry (1950).

Key to the Florida Species of *Euaresta*

1. Ground color of thorax black; cell R of wing with one hyaline spot; bulla distinctly present in cell R_5 (Fig. 27).
 *bella* (Loew)
- 1'. Ground color of thorax yellow; cell R of wing with more than one hyaline spots (usually 6); bulla usually absent, rarely a faint one present (Fig. 26).
 *aequalis* (Loew)

Euaresta aequalis (Loew)
 Figs. 27, 81, 131

Trypeta aequalis Loew, 1862. Smiths. Misc. Collect. 6(1): 86, pl. II, Fig. 20. Holotype ♂. Type locality: Illinois (MCZ).

Differentiated from all known *Euaresta* by being predominantly larger (5.85 mm) and by its distinctly yellow color. The hyaline spot near the apex of cell R_5 separated by a narrow brown area from the wing margin. Cell R_5 usually without a bulla, however, faint one may be present. The ovipositor of female long (5.0 mm); the sheath is about as long as the piercer, the sheath measures 2.0 mm long, piercer 1.4 mm; slender and narrow, apex gradually tapers to a sharp point. Male genitalia large and robust; epandrium truncate with scattered long setae (Fig. 81). Surstyli elongated and curved inward.

Length: body 5.1-5.3 mm; wing 4.7-5.0 mm. (N=5).

Hosts: No host information for Florida specimens

Xanthium sp. (Quinsenberry, 1950)

Distribution: A widespread species, occurring throughout United States. Previously recorded from Alabama, California, Colorado, District of Columbia, Idaho, Illinois, Indiana, Iowa, Kansas, Maryland, Minnesota, Nebraska, New Mexico, New York, North Carolina.

Florida Records: Escambia Co.: Bratt, 7♂ 24♀, 2-VIII-1933 (A. Blanton, USNM); 23♂ 12♀, 29-VIII-1933 (A. Blanton, USNM); 7♂ 2♀, 26-IX-1933 (A. Blanton, USNM); Gadsden Co.: Quincy, 1♂ 2♀ D-Vac (R) sample soybean field 20-IX-1977 (Y. Salleh, FSCA); 1♂ 1♀, D-Vac sample soybean, 5-X-1978 (Y. Salleh, FSCA); 1♂, D-Vac sample soybean, 5-X-1978 (Y. Salleh, FSCA).

This species occurs only in the northern portion of Florida.

Euaresta bella (Loew)
Figs. 27, 82, 132

Trypeta bella (Loew), 1862, Smiths. Misc. Collect., 6(1); 88, pl. II. Fig. 23. Holotype ♂. Type locality: Washington (MCZ).

Predominantly black, very readily differentiated from aequalis by its small size being only 2.9 mm. The presence of a bulla on cell R₃ and the absence of brown patch on the apical wing margin of cell R₅ distinguish bella from aequalis. The ovipositor sheath dark brown, about 0.8 mm long. The piercer 0.5 mm, with gradually pointed paex. Extended ovipositor 188 mm long. Male

genitalia small and compact. Epandrium highly arched, dark brown and with scattered setae dorsally (Fig. 82). Surstyli elongate and curved inward, apex rounded. Proctiger small with numerous long fine setae lateroventrally.

Length: body 2.8-3.2; wing 2.4-2.9 mm. (N=10).

Hosts: Unknown (Specimens are often caught on ragweed, Ambrosia artemissifolia (L.) and Bidens pilosa L.

Distribution: Florida, New York, North Carolina, Tennessee, Washington, and Wisconsin.

Florida Records: Alachua Co.: 8♂ 4♀, on Prunus angustifolia 17-III-1955 (H. V. Weems, Jr., FSCA); 2♂, on Prunus angustifolia, 14-II-1959 (H. V. Weems, Jr., FSCA); Gainesville, 4♂ 8♀, at Bidens pilosa, 11-XI-1956 (R. A. Morse, FSCA), 1♀, insect flight trap, 14-X-1971 (H. V. Weems, Jr. & C. R. Artaud, FSCA) 1♂, insect flight trap, 15-XI-1971 (H. V. Weems, Jr., & C. R. Artaud, FSCA); 1♀, insect flight trap, 30-XI-1971 (H. V. Weems, Jr., & C. R. Artaud, FSCA); 2♂ 2♀, Castanea pumila, 11-X-1972 (H. R. Dodge, FSCA); 3♂, insect flight trap, 23-25-X-1973 (H. V. Weems, Jr., FSCA), 1♂ 1♀, 31-XII-1975 (W. H. Pierce, FSCA); Dade Co.: Hialeah, 1♂, sweeping grasses and weeds, 14-VII-1965 (C. E. Stegmaier, Jr., FSCA); 1♀, sweeping grasses and weeds, 17-III-1965 (C. E. Stegmaier, Jr., FSCA); Flagler Co.: 1♂, 8-VII-1956 (H. V. Weems, Jr., FSCA); Highlands Co.: Archbold Biol. Stat. 1♀, 23-IV-1967 (B. V. Peterson, CNC); 1♂ 26-IV-1967 (B. V. Peterson, CNC); 12♂ 8♀, swept Ambrosia artemissifolia, 21-III-1978 (I. B. Rohani, FSCA); 8♂ 10♀, insect

flight trap, 22-25-III-1978 (H. V. Weems, Jr. & L. L. Lampert, Jr., FSCA); 1♂ 2♀, insect flight trap, 17-20-VI-1978 (H. V. Weems, Jr. & L. L. Lampert, Jr., FSCA); 5♂ 4♀, insect flight trap, 21-IV-1978 (H. V. Weems, Jr. & L. L. Lampert, Jr., FSCA); 2♂ 5♀, insect flight trap, 17-V-1979 (H. V. Weems, Jr. & Lisa Klein, FSCA); Sebring, 1♀, 8-III-1958 (H. V. Weems, Jr., FSCA); Jackson Co.: Cavern St. Park, 1♂, 9-VII-1954 (F. W. Mead, FSCA); Jefferson Co.: Monticello, 1♀, 4-8-X-1941 (AMNH); Martin Co., 1♂ 2♀, 5-XI-1954 (H. V. Weems, Jr., FSCA); Monroe, Co.: Boca Chica, 2♂ 4♀, sweeping roadside, 8-V-1971 (W. H. Pierce, FSCA); Everglades Nat'l Pk., 2♂, 30-XII-1953 (H. V. Weems, Jr., FSCA); 1♀, 15-XII-1961 (Munroe, Holland, & Chillcot, CNC) 1♀ 7-V-1967 (B. V. Peterson, CNC); Key Largo, 1♂ 1♀, 4-6-XII-1961 (Munroe, Holland & Chillcot, CNC); Orange Co.: Orlando, 6 (abdomen missing), sweeping ragweeds, 29-V-1929 (Evans, USNM); 1♂ 2♀, caught on ragweeds, 2-V-1930 (Benjamin & Nicholson, USNM); 12♂ 2♀, sweeping ragweeds, 13-V-1930 (E. Rivray, USNM); 2♂, caught on ragweed, 15-V-1930 (D. J. Nicholson, USNM); Sarasota Co.: Myakka River St. Pk., 1♂ 2♀, 5-VI-1954 (H. V. Weems, Jr., FSCA); Santa Rosa Co.: Milton, 2♂, 26-X-1932 (F. S. Blanton, FSCA); Volusia Co.: 1♂ 1♀ 24-VII-1954 (H. V. Weems, Jr., FSCA).

This species is very common and widespread and is easily differentiated from other Florida tephritids by its peculiar wing pattern with a distinct bulla on cell R₅.

Genus Euarestoides BenjaminEuarestoides Benjamin, 1934, U.S. Dept. Agric. Tech. Bull.401:57. Type species: Trypeta abstersa Loew.Closely related to Euaresta, Tephritis, and Trupanea.

Readily distinguished by the characteristic wing pattern, consisting of a yellow or brown reticulation in the proximal 1/2 and a dark stellate preapical pattern and by the presence of 3 pairs of lower fronto-orbital bristles. The anterior oral margin normal, only slightly produced. With 2 pairs of upper fronto-orbital bristles, the posterior pair not convergent. Thorax mostly yellow, covered with numerous yellow brown setae. Dorsocentral bristles nearer to transverse suture than to a transverse line between the supra-alars. Scutellum with 2 pairs of strong dark brown to black bristles. Abdomen yellow pollinose and densely covered with yellow to brown setae.

Little is known about the biology of the members of this genus; as far as is known, they inhabit flower ovaries. The genus is spread throughout southern Canada, United States, and the Neotropical Region. Of the 4 known Nearctic species, only 1 is reported from Florida. Foote (1958), in his revision of the genus, provided keys to all the species.

Euarestoides abstersus Loew.

Figs. 28, 83, 133

Trypeta abstensa Loew, 1862. Berlin Entomol. Zweitschr.

221. Holotype ♀. Type locality: North America (Vienna).

Readily differentiated from other known Euaestoides by the distinctive wing markings (Fig. 28) by having a dark area in the distal 1/2 of cell R, with a small hyaline spot close to its center. In addition, the proximal yellowish 1/2 of the wing with faint but discrete spots; apex of cell R₅ contains a hyaline spot that is much wider than long. Gena with irregular band with white setae. The ovipositor sheath yellow, densely covered with numerous setae approximately 0.8 mm long. The piercer short, about 0.6 mm long; the proximal 2/3 thin and straight-sided, apex gradually tapers to a sharp point. Extended ovipositor approximately 2.0 mm long. Male genitalia as in Fig. 83. The epandrium highly arched. Surstyli elongate, narrow, and sloping inward, apex rounded. Proctiger yellow, small, and elongate, with scattered setae on its dorsum.

Length: body 3.4-3.5 mm; wing 3.2-3.4 mm. (N=10).

Hosts: Ambrosia sp.

Trilisa paniculata (Walt. ex J. F. Gmel.) Cass.

Distribution: New York to Florida.

Florida Records: Dade Co.: Hialeah, 2♂ 1♀, swept Lippia, Pluchea Ambrosia, 20-VII-1965 (C. E. Segmaier, Jr., FSCA); 1♂, swept Pluchea sp., 21-VII-1965 (FSCA); Orange Co.: Bithlo; 1♂, off Trilisa paniculata, 17-XII-1929 (Chas. Kime, USNM); Conway, 19♂ 10♀, bred from Trilisa paniculata, 20-29-XI-1929 (D. J. Nicholson, USNM); Orlando, 1♀, reared from Trilisa paniculata, 12-XI-1929 (D. J. Nicholson NSNM); 1♀, reared from Trilisa paniculata 21-XI-1929 (D. J. Nicholson, USNM), 1♀, ex head Solidago tortifolia 22-XI-1929 (F. H. Benjamin, USNM); 2♀, ex head Trilisa paniculata

25-XI-1929 (F. H. Benjamin, USNM); 25♂ 21♀, reared from Trilisa paniculata, 18-25-XI-1929 (D. J. Nicholson, USNM); 20♂ 20♀, reared from Trilisa paniculata, 25-20-3XI-192 (D. J. Nicholson, USNM); 3♂ 21♀, ex Trilisa paniculata, 24-30-XI-1929 (F. H. Benjamin, USNM); 12♂ 11♀. reared from Trilisa paniculata, 5-XII-1929 (D. J. Nicholson, USNM).

In addition to the characters given above, this species can be further distinguished by the distinct but rather narrow extension of the preapical dark spot, 1 proximally bordering the hyaline spot located immediately anterior to the crossvein, the other extending from the apex of subcostal cell to a point near vein R_{4+5} . As far as is known, this species is restricted to the Atlantic States. This species commonly breeds in flower heads of Trilisa paniculata. Benjamin (1934) briefly described the immature stages of this species. Detailed morphology of the larvae was presented by Phillips (1946).

Genus Eurosta Loew

Eurosta Loew, 1873, Smiths. Misc. Collect. 11(256).

Type species: Trypeta solidaginis Fitch.

Predominantly large dark brown species which can be differentiated by the following characters: Vertex about 2 times the width of the eyes. Antennae short, with long plumose arista. Two pairs of upper fronto-orbital bristles, the posterior pair short and scale-like; 3 to 4 pairs of lower fronto-orbital bristles present. Thorax with numerous small yellow setae. Dorsocentral

bristles closer to a transverse line between supra-alar bristles than to a line between acrostichal bristles. Scutellum swollen, with 1 to 2 pairs bristles, and sometimes 2 to 7 bristles present. Wing broad consisting of a dark field interrupted by hayline spots. Vein R_1 setose over the entire length. Vein R_{4+5} setose to beyond $r-m$ crossvein. Abdomen broad, with numerous yellow to dark brown setae.

Larvae form galls in stems and roots of a variety of plants. The species appear to be host specific and each forms a characteristic gall on its host plant. The genus is strictly Nearctic and contains 10 species. Of these, 4 are known to occur in Florida. Steyskal and Foote (1977) provided keys to the adults of North American Eurosta.

Key to the Florida Species of Eurosta

1. Wing marked with a reticulate hyaline pattern; hyaline spots small and faint; apical $1/2$ of 2nd, 3rd, and 4th vein normal. 2
- 1'. Wing without such pattern; hyaline spots large and discrete (Fig. 30); apical $1/2$ of 2nd, 3rd, 4th vein undulating. donyssa (Walker)
2. Pale marking at the end of anal vein little developed, not extending $1/2$ way across cell Cu_1 (Fig. 29); ovipositor sheath short; lower margin of epandrium square and straight comma (Wiedemann)

3. Anal pale spots of wing with discrete margin; (Fig. 31);
the piercer of female ovipositor long. fenestrata Snow
- 3'. Anal pale spot reticulate, at least around wing margin
(Fig. 32) the piercer short. floridensis Foote

Eurosta comma (Wiedemann)
Figs. 29, 84, 134

Trypeta comma Wiedemann, 1830, Auss. Zweifl. Ins. 2:478.

Holotype ♀. Type locality: Kentucky.

Readily differentiated by the wing markings (Fig. 29) and by the head and thoracic chaetotoxy. Wing predominantly brown with numerous tiny hyaline spots. The markings at the end of anal vein pale and little developed. Head with 2 pairs of upper fronto-orbital bristles, the posterior pair pale and scale-like, 3 pairs of lower fronto-orbital bristles. Scutellum with 2 pairs of scutellars. Ovipositor sheath short, 2.1 mm. Piercer 1.5 mm long, apex gradually tapers to sharp point. Extended ovipositor 5.3 mm long. Male genitalia as in Fig. 84. Epandrium wide with long setae laterally, lower margin of epandrium square. Surstyli slender and narrow, apices truncate with 2 blunt tips. Proctiger small with numerous long setae over the surface.

Length: body 7.2-7.8 mm; wing 7.1-7.5 (N=10).

Hosts: Solidago fistulosa Mill.

Solidago sp.

Distribution: Colorado to Maine, south to north Florida

Florida Records: Hamilton Co.: Jasper, 8♂ 2♀, bred from Solidago root galls, 19-26-XI-1930 (D. J. Nicholson, USNM); Lake Co.: Groveland, 8-XII-1966 (W. P. Henderson, FSCA); Tavares, 8♂ 4♀, bred from Solidago sp. root gall, 6-13-XII-1930 (D. J. Nicholson USNM); Orange Co.: Fort Christmas, 4♂ 1♀, bred from Solidago fistulosa, 30-XII-1930 (D. J. Nicholson, USNM); Orlando, 12♂ 10♀, bred from root galls of Solidago sp., 3-14-XII-1929 (D. J. Nicholson, USNM); 12♂ 5♀, bred from Solidago fistulosa 7-11-I-1931 (D. J. Nicholson, USNM); 2♀, bred from Solidago fistulosa galls, 15-16-I-1931 (D. J. Nicholson, USNM); 82♂ 33♀, bred from Solidago fistulosa, 19-29-XII-1930 (D. J. Nicholson, USNM); Orlovista, 30♂ 8♀, bred from Solidago root galls, 5-12-I-1930 (D. J. Nicholson, USNM); Seminole Co.: Oviedo, 5♂ 2♀, bred from Solidago sp. root galls, 5-21-I-1931 (D. J. Nicholson, USNM); 12♂ 4♀, bred from Solidago root galls, 21-28-I-1931 (D. J. Nicholson, USNM).

Probably the most commonly collected species of this genus in North America and Florida. This species is differentiated from other known Eurosta by the distinctive pattern on the wing; the narrow crescentic hyaline mark at the apex of the wing is broken into small spots by darkening about ends of 3rd and 4th veins, also the pale marking at the end of anal vein is little developed, not extending over 1/2 way across cell Cu₁.

Larvae of this species normally feed singly in galls on roots of golden rods. Benjamin (1934) and Phillips (1946) described the larval morphology.

Eurosta donysa Walker
Figs. 30, 85, 135

Trypeta donysa Walker, 1849, List Spec. Dipt. Ins. Brit.

Mus. 4:1007. Holotype ♂. Type locality: unknown

A moderately large brown species characterized by having wings with large and discrete hyaline spots (Fig. 30). Veins R_1 , R_{4+5} undulating. Hyaline area in the middle of cell Cu_1 large. Scutellum with 2-6 bristles, the apical pair normally reduced. Male genitalia as in Fig. 85. Epandrium dark brown broad with numerous scattered setae; lower margin of epandrium square. Surstyli slender and narrow; apex truncate with blunt lower lobe. Proctiger small, densely setose lateroventrally. female ovipositor was not available for dissection.

Length: body 7.0-7.8 mm; wing 7.5-7.7 mm. (N=4).

Hosts: Solidago champmanii T & G

Solidago Sp.

Distribution: Known only from Florida

Florida Records: Brevard Co.: Merritt Island, 1♂, 12-III-1956 (H. W. Weems, Jr., FSCA); Titusville, 3♂, bred from round stem gall Solidago sp., 10-III-1931 (D. J. Nicholson, USNM); 4♂ 1♀, bred from gall on stalk Solidago sp. 12-16-III-1931 (D. J. Nicholson, USNM).

E. donysa may be differentiated from other known Florida Eurosta by the lack of reticulate hyaline pattern on the disc and by the large and discrete hyaline spots on a dark field. This species was described by Benjamin (1934) as nicholsoni

benjamin. Foote (1964) indicated that donysa was conspecific with nicholsoni and was the prior name. Larvae feed in small round galls on stems of Solidago sp. The immature stages were briefly described by Benjamin (1934).

Eurosta fenestrata Snow
Figs. 31, 86, 136

Eurosta fenestrata Snow, 1894, Kans. Univ. Quart. 2(3): 169, pl. VII, Fig. 7. Holotype ♀. Type locality: Morrison, Arizona.

Light brown species. Frontal bristles weak, with 2 pairs of upper fronto-orbitals and 3 pairs of lower fronto-orbitals. Mesonotum with yellow setae. Scutellum with 2 pairs of scutellars. Wing moderately broad, with hyaline areas almost similar to that of comma. Differing from it by having apical $1/2$ of cell R_1 with a small hyaline area along the costal (Fig. 31). Also by having the apex of wing with narrow crescentric hyaline mark continuous, not broken into 3 small spots by darkening about ends of veins R_{3+4} and M_{1+2} . The hyaline area at the end of anal vein large with discrete margins and extending through the middle of cell Cu_1 ending at middle of vein $M_3 + Cu_1$. Abdomen slender, bright brown, and mostly yellow setose. Female ovipositor not dissected. Male genitalia as in Fig. 86, epandrium broad with scattered setae. Like other members of this genus, surstyli narrow and long, with

rounded lobes at apices. Proctiger small and elongate, with scattered setae lateroventrally.

Length: body 7.0-7.8 mm; wing 7.3-7.5 mm. (N=3).

Hosts: Unknown

Distribution: Arizona, east to Oklahoma and Ontario, Florida.

Florida Records: The only record was given by Johnson (1909): St. Johns Co.: St. Augustine, no date was given. The specimen illustrated is from Colorado.

The above description is based on specimens from Colorado. This species is normally found in central and northern North America, east to Oklahoma and Ontario. It is very rare in Florida and has never been collected since the last record of Johnson (1909). Nothing is known about its immature stages and biology.

Eurosta floridensis Foote
Figs. 32, 137

Eurosta floridensis Foote, 1977, Proc. Entomol. Soc. Wash. 79(1):148, Fig. 7-10, 17. Holotype ♀. Type locality: Jasper, Florida (USNM).

Resembling other species in the genus in general appearance, but differentiated from them by the color pattern of wing. Wing with numerous distinct rounded light spots scattered over the disc. Narrow hyaline arc spots restricted to apex of 2nd M₂, usually a small isolated spot immediately anterior to it at apex of cell R₅. Proximal light area of wing disc distinctly hyaline in cell Cu₁,

usually with irregular margins. Female ovipositor long, about 5.4 mm. Ovipositor sheath dark brown and with scattered setae, about 2.3 mm long. Piercer 1.6 mm long apex gradually tapers to a sharp point. Male genitalia not dissected. Epandrium broad and highly arched; lower margin of epandrium emarginate in profile. Surstyli long, each developed into 2 short, more or less rounded lobes at apex. Proctiger elongated, with numerous long setae lateroventrally.

Length: body 6.8-7.4 mm; wing 6.7-7.4 mm. (N=4).

Hosts: Solidago fistulosa Mill.

Solidago sp.

Distribution: Known only from Florida

Florida Records: Hamilton Co.: Jasper (paratype), 1♂ 1♀, bred from Solidago sp., 28-X-1930 (D. J. Nicholson, USNM); (holotype), 1♀, bred from Solidago sp., 11-18-XII-1930 (D. J. Nicholson, USNM); (paratype) 1♀, bred from Solidago sp. 11-18-XII-1930 (D. J. Nicholson, USNM); (paratype) 1♂, bred from Solidago sp., 5-XII-1930 (D. J. Nicholson, USNM); (paratype) 1♀, bred from Solidago sp. 19-XII-1930 (D. J. Nicholson, USNM); Marion Co.: Dunellon, (allotype) 1♂, bred from Solidago sp. 61-XII-1930 (D. J. Nicholson, USNM); Orange Co.: Orlando, (paratype) 1♀, bred from Solidago sp., 19-29-VII-1930 (D. J. Nicholson, USNM); (paratype) 1♂, bred from Solidago fistulosa, 29-XII-1930 (D. J. Nicholson, USNM); (paratype) 1♀, bred from Solidago sp. 21-28-I-1931 (D. J. Nicholson, USNM).

This species is apparently closely related to fenestrata.

It can be differentiated from the latter by the wing pattern, the female ovipositor and by the characters on male genitalia. Nothing is known about its biology and immature stages. A detailed description and illustration of this species was given in Steyskal and Foote (1977).

Genus Myoleja Rondani

Myoleja Rondani 1856, Dipt. Ital. Prod. 1:112. Type

species: Tephritis lucida Fallen.

Predominantly yellow to dark brown species characterized by having 2 pairs of upper fronto-orbitals, 3 pairs of lower fronto-orbitals and rather weak cellars. Head and body bristles black. Mesonotum densely setose with short decumbant yellow to black setae. Dorsoecentral variable in position, maybe only slightly behind supra-alars or well behind these bristles nearer to the intra-alars. Scutellum with 2 pairs of scutellars. Wing with dark infuscation and highly contrasting hyaline marking. Vein R_4+5 setose to about the level of r-m crossvein. Crossvein m parallel or nearly so with r-m crossvein and perpendicular in position, r-m crossvein situated distinctly beyond middle of cell 1st M_2 . At least 1 triangular hyaline spot immediately beyond the apex of the stigma.

Virtually nothing is known about the biology of the species.

The genus is Holarctic with 4 Nearctic species, 3 of which are

known to occur in Florida. There is no recent revision of the genus. Blanc and Foote (1961) and Steyskal (1972) have keyed the North American members of the genus.

Key of the Florida Species of *Myoleja*

1. Cell 2nd M_2 with a hyaline triangle, cell R_5 dark brown with a round hyaline spot anterior of m crossvein; cell Cu_1 with 2 hyaline areas; abdomen largely blackish; male with 2 or 3 greatly enlarged lower fronto-orbitals. . . . nigricornis Doone)
- 1'. Cell 2nd M_2 with 2 hyaline areas, at least 1 extending into cell R_5 ; cell R_5 dark brown with 3 hyaline areas; cell Cu_1 with one hyaline area, abdomen yellowish or blackish; male lower fronto-orbital normal or enlarged. 2
2. Cell R dark brown with a hyaline spot in the middle, apex of cell 1st M_2 with a hyaline cross band that extends to costa; abdomen largely yellowish; male lower fronto-orbitals greatly enlarged. rhino Steyskal
- 2'. Cell R dark brown without hyaline spot; apex of cell 1st M_2 with a hyaline spot often extended forward to form more or less interrupted series with spots in the base of cell R_5 ; abdomen blackish, male lower fronto-orbitals normal.
 limata (Coquillett)

Myoleja limata (Coquillett)

Figs. 33, 87, 138

Acinia limata Coquillett, 1899, J. N.Y. Entomol. Soc.

7:263. Holotype ♀. Type locality: New Bedford, Massachusetts (USNM).

Predominantly dark brown species readily differentiated by its distinct wing pattern (Fig. 33). Wing with dark brown marking in the center of the disc. The anterior hyaline wedges reaching cell $R_4 + 5$; the distal wedge extends into cell R_5 . Cell R lacks a hyaline spot. The lower fronto-orbitals in male bristles normal. Abdominal terga black. Ovipositor sheath short, dorsum very dense brown to black setose and measures 1.2 mm. The piercer narrow, blunt, and more or less rounded at apex, approximately 1.1 mm. Extended ovipositor about 3.2 mm long. Male genitalia as in Fig. 87. Epandrium highly arched, dorsum with numerous setae. Surstyli long, and slightly curved inward, apex more or less rounded. Proctiger large and elongate, the dorsum covered with numerous scattered setae, the lateroventral surface covered with long but less dense setae.

Length: body 3.6-5.2 mm; wing 3.2-4.4 mm. (N=10)

Host: Ilex caroliniana (Walt.) Trelease

Ilex cassine L.

Ilex coriacea (Pursh) Chapm.

Ilex decidua Walt.

Ilex glabra (L.) A. Gray.

Ilex opaca Ait.Ilex vomitoria Ait.

Distribution: Massachusetts to Florida.

Florida Records: Alachua Co.: Gainesville, 1♂ 1♀, Ilex opaca, 14-XII-1971 (L. C. Kuitest, FSCA); Baker Co.: MacLenny, 1♀, in McPhail trap, 27-X-1969 (Hugh Collins, FSCA); Citrus Co.: Crystal River, 1♂ 2♀, Ilex vomitoria 24-X-1930 (D. J. Nicholson, USNM); Homosassa, 1♂ 1♀, from Ilex vomitoria (D. J. Nicholson & J. C. Graves, USNM). Dade Co.: Cutler, 1♀, in McPhail trap, 18-VII-1964 (H. S. Creamer, FSCA); Duval Co.: Jacksonville, 1♀, in McPhail trap, 2-XI-1964 (L. W. Taylor, FSCA); 4♂ 6♀, in McPhail trap, 8-X-1968 (L. W. Taylor, FSCA); Hardee Co.: Wauchula, 15♂ 3♀, in McPhail trap in grapefruit, 16-X-1968 (R. H. Rhodes, FSCA); Highlands Co.: Sebring, 1♂ 1♀, in Steiner trap, 9-XI-1964 (Ted Morris, FSCA); Hillsborough Co.: Antioch, 7♂ 8♀, emerged from Ilex cassine 11-XI-1929 (W. H. Pope, USNM); 4♂ 3♀, emerged from Ilex cassine, 12-25-XI-1929 (D. J. Nicholson, USNM); Riverview, 2♂ 1♀, from Ilex cassine, 8-IX-1930 (Pope & Mutz, USNM); Tampa, 11♂ 8♀, reared from Ilex glabra, 1-X-1930 (F. S. Blanton, FSCA); 4♂ 2♀, bred from Ilex cassine, 6-VI-1930 (F. S. Blanton, FSCA); 2♂ 1♀, in McPhail trap, 18-VIII-1967 (G. W. Barber, FSCA); 1♂, in McPhail trap, 3-XI-1967 (T. J. Favordso, FSCA); Indian River Co.: Vero Beach, 1♀, in Mexican fruit fly trap, 30-X-1959 (R. H. Kendrick, FSCA); 1♀, stickyboard trap, 11-X-1965 (R. H. Kendrick, FSCA); Lake Co.: 7♂, emerged from Ilex cassine, 11-15-X-1929.

(J. G. Wilson, USNM); Lake Jorita, 15♂ 12♀, emerged from Ilex cassine, 5-11-XI-1929 (M. Dodd, USNM), Levy Co.: Gulf Hammock 3♂, from Ilex cassine, VII-1930 (J. W. McGlaery, USNM); Marion Co.: Ocala Nat'l Forest, 5♂ 2♀, Ilex opaca 4-13-X-1930 (F. S. Blanton, USNM); Monroe Co.: Everglades Nat'l Pk, 16♂ 12♀, at Ilex cassine, III-1939 (J. W. Ludlam, FSCA); Orange Co.: Pine Castle, 2♂, emerged from Ilex cassine, 2-3-X-1929 (F. H. Benjamin, USNM). Vineland, 8♂ 1♀, from Ilex cassine, 23-IX-1929 (USNM); Palm Beach Co.: West Palm Beach, 1♂, fruit fly, 7-I-1960 (M. L. Messer, FSCA); 1♂, fruit fly trap 17-II-1961 (M. L. Messer, FSCA), 1♀, fruit fly trap, 16-V-1961 (M. L. Messer, FSCA); 6♂, in McPhail trap, 24-I-1962 (M. L. Messer, FSCA); 1♂, in McPhail trap, 19-II-1964 (M. L. Messer, FSCA); 1♂, in McPhail trap, 2-III-1966 (M. L. Messer, FSCA); Pasco Co.: Dade City, 1♀, in McPhail trap in grape-fruit trees, 28-X-1966, (O. D. Kennedy, FSCA); Polk Co.: in Steiner trap, 26-VIII-1963 (R. E. Vild, FSCA); Haines City, 18♂ 2♀, emerged from Ilex cassine, 12-14-IX-1929 (C. A. Garatt, USNM); Putnam Co.: Welaka, 2♂ 1♀, reared from Ilex caroliniana, 8-9-VII-1930 (M. Dodd, USNM); Seminole Co.: Altamonte Spg., 2♂ 2♀, emerged from Ilex cassine, 19-IX-1929 (J. G. Wilson, USNM); Volusia Co.: Coronado Beach (New Smyrna Bch); 15♂ 2♀, emerged from Ilex vomitoria, 8-X-1929 (V. A. Newell, USNM).

This species is generally distributed throughout Florida.

It is the only American species whose biology is known. The larvae feed singly in the berries of various species of holly.

Benjamin (1934) described briefly the immature stages of this species. Phillips (1946) described in detail the morphology of the larva and added Ilex decidua to the host list.

Myoleja nigricornis (Doone)

Figs. 34, 88

Aciura nigricornis Doane, 1899, J. N.Y. Entomol. Soc.

7:183, pl. III, Fig. 7. Holotype, sex unknown. Type locality: Pennsylvania.

Readily differentiated from all known Florida Myoleja by having 2 large hyaline triangles on the anterior margin, through cell R₃ and a hyaline triangle through cell 2nd M₂ (Fig. 34) Middle of cell R with a hyaline spot. Vein R₄₊₅ setose. Male with 2 or 3 greatly enlarged lower fronto-orbitals. Thorax and abdomen subshining dark brown to black. Dorsocentral bristles situated just slightly behind a line drawn between supra-alars. Apical scutellar, rather small; Female ovipositor short, 2.0 mm; the ovipositor sheath black, as broad as the length, approximately 0.7 mm long. Piercer short and thick, abruptly tapered to a sharp apex with minutely serrated margin and approximately 0.7 mm long. Male genitalia as in Fig. 88. Epandrium dark brown to black, with numerous long black setae. Surstyli narrow and blunt, apices truncate: Proctigeryellow, large and protruded, with numerous long black setae laterodorsally and ventrally.

Length: body, 3.4-5.2 mm; wing 3.9-4.5 mm. (N=2).

Hosts: Unknown.

Distribution: Michigan to Maine, south to Florida.

Florida Records: Foote (1965) indicates that the species is found in Florida. However, the specimens on hand are from New York.

Nothing is known about the biology of this species. The male of this species superficially resembles male of rhino Steyskal in having the lower fronto-orbitals greatly enlarged but is easily differentiated by its dark body and wing pattern.

Myoleja rhino Steyskal

Figs. 35, 89, 139

Myoleja rhino Steyskal, 1972, Fla. Entomol. 55:207,

Fig. 1. Holotype ♂. Type locality: Lake Placid, Highlands Co.: Florida (USNM).

Superficially, resembling nigricornis in having the lower fronto-orbitals of male greatly enlarged, but differs in having the wing pattern distinctly different, almost resembling Strauzia longipennis (Wiedemann). The hyaline crossband from the costa extends through cell 1st M₂. Cell R with a distinct hyaline spot. Vein R₄₊₅ setose. Body polished, yellow brown. Dorso-central bristles anterad of acrostichals 2/3 of distance between latter. Ovipositor sheath yellow tinged with brown, about 1.2 mm long. Piercer slender, apex tapered to a very sharp point,

1.0 mm long. Extended ovipositor 5.2 mm long. Male genitalia as in Fig. 89. Epandrium brown with long setae mid-dorsally. Surstyli narrow and blunt, truncate at apices. Proctiger large, more or less rounded and elongate, with scattered setae dorsally and ventrally.

Hosts Unknown.

Distribution: Known only from Florida.

Florida Records: Brevard Co.: 1♀, 10-III-1936 (L. S. Light, Jr., FSCA); Duval Co.: Jacksonville, 1♂, in McPhail trap, 20-IX-1973 (L. W. Taylor, FSCA); Highlands Co., Archbold Biol. Sta., 1♂ 1♀, 6-10-IV-1968 (FSCA); 1♂, 9-III-1902 (S. W. Frost, USNM); 1♂ 1♀, 24-VI-1962 (S. W. Frost, USNM) Pasco Co.: San Antonio, 1♀, in McPhail trap, 29-III-1968 (O. D. Kennedy, FSCA); Polk Co., Winter Haven, 1♂, 4-III-1965 (R. E. Vildi, FSCA); St. Johns Co.: St. Augustine, 1♀, in McPhail trap, 1-V-1969 (E. Graham, FSCA), Volusia Co., Orange City, 1♂, 2-IV-1973 (J. N. Pott, FSCA);

Nothing is known about the biology of this species. The wing pattern is very similar to those of Strauzia longipennis (Wiedemann) and M. caesio (Harris), but differs from the latter species by the presence of a hyaline spot in cell R.

Genus Neaspilota Osten Sacken

Neaspilota Osten Sacken, 1878, Smiths. Misc. Collect.

16 (2):192. Type species: Trypeta alba Loew.

Predominantly white or yellow pollinose body. Head bristles weak. Usually with 2 pairs of upper fronto-orbitals, the posterior pair converging and with 3 pairs of lower fronto-orbitals. Mesonotum finely pollinose, dorsocentral bristles situated distinctly behind anterior supra-alars. Scutellum with 2 pairs of long scutellars. Legs yellow. Wing mostly hyaline, but may have several dark markings on the disc, in addition to those in the stigma. Vein R_1 setose; vein R_{4+5} bare.

Members of this genus are recognized easily by the hyaline wings. Adults commonly inhabit composites, and the larvae develop in the flower heads. The genus is entirely Nearctic. Of 11 species in the genus, 5 are known from Florida. There is no complete revision of the genus, but Phillips (1923), Benjamin (1934), Malloch (1942), and Quinsberry (1949) provided keys to several species in this genus.

Key to the Florida Species of Neaspilota

1. Wing with several dark markings on the disc, in addition to the one in the stigma (Figs. 36, 40) 2
- 1'. Wing without such markings, or at least with dark markings restricted to the stigma (Fig. 38, 39) 3
2. Frons pubescent, apical dark markings on wing reaching the apex of vein M_{1+2} (Fig. 40) vernoniae Loew
- 2'. Frons bare; apical dark markings on the wing not reaching vein M_{1+2} (Fig. 36) achilleae Johnson

3. Fronto-facial angle rounded, frons pubescent (Fig. 38).
 floridana n. sp.
- 3'. Fronto-facial angular; frons bare. 4
4. Stigma of both sexes with a distinct dark spot in basal 1-3
 (Fig. 39); hind tibia of male with 2 erect preapical setae
 that project ventrally. punctistigma Benjamin
- 4'. Stigma usually completely hyaline, seldom with a faint spot
 (Fig. 37); hind tibia of male without such characters.
 dolosa Benjamin

Neaspilota achilleae Johnson
 Figs. 36, 90, 140

Neaspilota achilleae Johnson, 1900, Entomol. News 11:

328, Fig. 3. Holotype ♀. Type locality: unknown.

Superficially resembling vernoniae, but differing by being smaller, approximately 2.7-3.3 mm. Head bristles weak, frons bare. Lower 1/2 of the sternopleura and anterior margin of the thorax black; thorax bright lemon yellow, appears pollinose silvery gray with tongue-like pattern in fresh specimens. Wing as in Fig. 36, with several dark markings on the disc; the apical dark marking on the wing reaching up to vein $R_4 + 5$. The ovipositor approximately 2.5 mm long. The piercer 0.8 mm long and with few serrations at the tip. malegenitalia luteous, small and compact (Fig. 90). Epandrium narrow, dorsum with long fine setae. Surstyli broad, apex truncate. Proctiger small and elongate, dorsum with scattered fine setae, ventral margin with thick setae.

Length: body 3.0-3.5 mm; wing 2.7-3.3 mm. (N=10).

Hosts: Aster carolinianus Wlat,

Aster concolor L.

Aster totifolius Walt.

Chrysopsis graminifolia (Michx.) Ell.

Erigeron strigosus Muhl. ex Willd.

Erigeron vernus (L.) Toor & A. Gray

Heterotheca nervosa (Willd.) Shinnars var. microcephala
Small) Shinnars

Heterotheca obligantha (Chapm) Harms.

Hieracium argyraeum Small

Hieracium gronovii L.

Hieracium scabrum Michx.

Distribution: New Jersey, Pennsylvania, Georgia, Maine to
Florida

Florida Records: Alachua Co.: Gainesville, 1♀, insect flight
trap, 28-IX-1971 (H. V. Weems, Jr., FSCA); 2♂, insect flight trap
13-X-1971 (H. V. Weems, Jr., FSCA); 1♀, insect flight trap, 3-XI-
1971 (H. V. Weems, Jr. & C. R. Artaud, FSCA); 1♂, blacklight trap,
14-VII-1972 (F. W. Mead, FSCAP; 1♂ 1♀, 6-8-XI-1972 (H. R. Dodge,
FSCA); 2♂ 2♀, reared from Hieracium gronovii, 1-XI-1978 (I. B.
Rohani, FSCA); 1♂, reared from Aster dumosus, 10-XI-1978 (E. B.
Rohani, FSCA); 1♂ 1♀, reared from Chrysopsis graminifolia, 19-XI-1978
(I. B. Rohani, FSCA); Brevard So.: Indian River City, 1♂ 1♀, bred
from Hieracium argyraeum, 8-VI-1930 (F. S. Blanton, FSCA); 1♂ 4♀

bred from Hieracium argyraeum, 14-10-VI-1930 (D. J. Nicholson, USNM); Clay Co.: Keystone Heights, 7♂ 3♀, bred from Hieracium gronovii, 5-X-1978 (I. B. Rohani, FSCA); 15♂ 17♀, bred from Hieracium gronovii, 9-13-X-1978 (I. B. Rohani, FSCA); Duval Co.: Jacksonville, Pebbly Beach, 1♂, 8-V-1908 AMNH) Hillsborough Co.: Tampa, 3♂ 2♀, bred from Hieracium argyraeum, 1-V-1930 (D. J. Nicholson, USNM); Orange Co.: Bithlo, 2♂ 1♀, bred from Aster tortifolius, 17-VI-1930 (D. J. Nicholson, USNM); Conway, 2♂, bred from Hieracium argyraeum, 17-VI-1930 (Pope & White, USNM); 1♀, Citrus sp., 25-VII-1948 (O. D. Link, FSCA); Orlando, 1♂ 2♀, bred from Erigeron vernus, 2-V-1930 FSCA); 2♂, bred from Hieracium argyraeum, 27-V-1930 (D. J. Nicholson, USNM); 50♂ 20♀, bred Hieracium argyraeum, 10-24-VI-1930 (D. J. Nicholson, USNM); 10♂ 20♀, bred from Hieracium gronovii, 4-VIII-1930 (D. J. Nicholson, USNM); 13♂ 5♀, bred from Hieracium gronovii, 2-4-X-1930 (D. J. Nicholson, USNM); 24♂ 14♀, bred from Hieracium scabrum, 8-10-X-1930 (D. J. Nicholson, USNM); 8♂, bred from Hieracium scabrum, 3-19-III-1931 (D. J. Nicholson, USNM); Orlovista, 4♂ 4♀, bred from Hieracium scabrum, 14-16-X-1930 (D. J. Nicholson, USNM); Plymouth, 4♂ 3♀, bred from Hieracium argyraeum, 26-VII-1930 (Pope & White, USNM); Polk Co.: Griffin, 5♂ 2♀, bred from Hieracium argyraeum, 21-VI-1930 (Pope & White, USNM).

This species has been adequately described by Johnson (1900) and Benjamin (1934). It is widespread and the most commonly encountered Neaspilota in Florida. The biology and immature stages of this species have been described by Benjamin (1934). The larvae and pupae of this species are identical to that of

dolosa except for dark markings on the terminal segments of both
(Benjamin, 1934).

Neaspilota dolosa Benjamin
Figs. 37, 91, 141

Neaspilota dolosa Benjamin, 1934. U.S. Dept. Agric. Tech.
Bull. 401:39, Fig. 29. Holotype ♂. Type locality: Orlando,
Orange Co., Florida, USNM).

Closely resembles floridana n. sp., but differs strikingly
by having the fronto-facial angle more angular and its frons bare.
Readily differentiated from punctistigma Benjamin, its close rela-
tive by the absence of distinct dark spot in the stigma (Fig. 37) .
The ovipositor. sheath yellow, apex tinged with brown approximately
1.1 mm long, piercer 0.9 mm long, thin and pointed apically.
Extended ovipositor 2.9 mm long. Male genitalia as in Fig. 91
pale yellow and small. Epandrium narrow, dorsum with scattered
long setae. Surstyli broadly rounded, almost truncate at apices.
Proctiger elongated, with scattered long setae.

Length: body 2.8-3.8 mm; wing 2.2-2.8 mm. (N=6).

Hosts: Carduus sp.

Erigeron quercifolius Lam.

Erigeron strigosus Muhl. ex Willd.

Erigeron vernus (L.) Torr. & A. Gray

Happlopappus phyllocephalus DC var. megaphallus

(Nash) Waterfall

Heterotheca subaxillaries (Lam.) Britt & Rusby

Distribution: Restricted to Florida

Florida Records: Alachua Co.: 1♂, at Aronia arbutifolia, 14-II-1954 (H. V. Weems, Jr., FSCA); 1♂, Stachys floridana, 12-IV-1956 (R. A. Morse, FSCA); Gainesville, 1♂ 1♀, sweeping weeds, 22-III-1956 (R. A. Morse, FACA); Brevard Co.: Indian River City, 2♂ 1♀, bred from Erigeron vernus, 14-IV-1930 (D. J. Nicholson, USNM); Cocoa, 1♂ 2♀, bred from Heterotheca subaxillaries, 17-VI-1930 (D. J. Nicholson, USNM); 2♂ 1♀, bred from Heterotheca subaxillaries, 24-VI-1930 D. J. Nicholson, USNM); Dade Co.: Miami, 2♂ 1♀, ex flower head Erigeron strigosus, 4-IV-1971 (C. E. Stegmaier, Jr., USNM); Miami Beach, 1♂ 1♀, bred from Erigeron vernus, 19-V-1930 (D. J. Nicholson, USNM); Duval Co.: Jacksonville, 1♂ 2♀, 14-X-1932 (F. S. Blanton, FSCA); Lake Co.: 3♂ 1♀, 9-IV-1956 (R. A. Morse, FSCA); Clermont, 1♂, bred from Heterotheca subaxillaries, 20-VI-1930 (D. J. Nicholson, USNM); 5♂ 1♀, bred from Heterotheca subaxillaries 28-30-VI-1930 (D. J. Nicholson, USNM); Leesburg, ♀, bred from Heterotheca subaxillaries, 14-VII-1930 (E. T. Evans & D. J. Nicholson, USNM); Manatee Co.: Bradenton, 3♂ 2♀, swept Erigeron quercifolius, 17-IV-1979 (I. B. Rohani, FSCA); 1♂, reared from Erigeron quercifolius, 17-IV-1930 (I. B. Rohani, FSCA); Marion Co.: Belleview, 2♀, bred from Heterotheca subaxillaries, 14-VII-1930 (D. J. Nicholson, & E. T. Evans, USNM); Dunnellon, 1♂, 2-IX-1972 (H. V. Weems, Jr., FSCA); Orange Co.: Apopka, 2♂ 2♀, bred from Erigeron vernus (D. J. Nicholson, USNM); Forest City (Maitland), 16♂ 8♀, bred from Heterotheca subaxillaries, 12-14-VII-1930 (D. J. Nicholson, USNM); Orlando, 6♂, 1-V-1930 (F. S. Blanton, FSCA); 4♂ 6♀, reared from

Erigeron vernus, 9-V-1930 (C. S. Blanton, FSCA); 29♂ 22♀, bred from Heterotheca subaxillaries, 21-30-VI-1930 (D. J. Nicholson, USNM)
 8♂ 3♀, bred from Heterotheca subaxillaries 2-8-VI-1930 (D. J. Nicholson, USNM):
 4♂ 2♀, bred from Heterotheca subaxillaries, 30-VI-1930 (D. J. Nicholson, USNM); Osceola Co.: Deer Park, 8♂ 7♀, 2-V-1930, bred from Heterotheca subaxillaries, 2-V-1930 (D. J. Nicholson, USNM); Pasco Co.: Jasamin Point (Dade City); 6♂ 9♀, bred from Haplopappus phyllocephalus var. megacephalus, 24-30-1928 (D. J. Nicholson, USNM); Seminole Co.: Oviedo, 1♂, caught on Carduus sp., 6-IV-1930 (Benjamin, USNM)
 Wakulla Co.: Newport, 3♂ 1♀, bred from Heterotheca subaxillaries, 30-VI-1930 (D. J. Nicholson, USNM).

This species has not been collected outside of Florida where it occurs throughout most of the state. The larvae feed singly on flower heads of sexual composites. Their immature stages vary in size proportionately with the corresponding adults and are almost identical with those of achilleae (Benjamin, 1934).

Neaspilota floridana Rohani, n. sp.

Figs. 10, 38, 92, 142

Superficially resembling alba (Loew), a more northern species, and some Florida species because of the entirely hyaline wing and predominantly yellow pollinose body. It differs from all other known Neaspilota by the characters on head, female ovipositor and male genitalia (Fig. 10C-J, 92).

This species was first brought to my attention by Mr. Ammon Friedberg, c/o U.S. National Museum, when he revised the

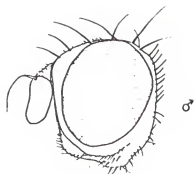
subfamily Terellinae. This was recognized as an undescribed species because of the characters mentioned above. It was earlier identified as Neaspilota alba (Loew) by Benjamin (1934).

Female. Predominantly yellow species. Head as in Fig. 10A. Vertex and frons yellow pollinose, the fronto-facial angle rounded; frons pubescent with whitish tomentum. Two pairs of upper fronto-orbitals, 3 pairs of lower fronto-orbitals, the lower pair strong. Face yellow, with slight concavity, epistomal margin slightly expanded. Thorax entirely yellow pollinose, appearing silvery gray. Chaetotaxy typical of the genus with dorsocentral bristles situated distinctly behind supra-alars. Legs entirely yellow rufous, the bristling as in other member of this genus. Wing entirely hyaline except for yellowish tinge in the stigma similar to alba. Abdomen polished yellow in ground color, dorsum rather dense gray pubescence. The ovipositor sheath light yellow tinged with brown on the proximal and distal ends, about 0.7 mm long; apex piercer abruptly tapered to a sharp point (Fig. 10D). The largest spicules of rasps are somewhat more narrow and acute than that of alba (Fig. 10E). Spermatheca oval as in Fig. 10F. Extended ovipositor 2.3 mm long.

Male. Same as in ♀ except for postabdominal characters. Male genitalia as in Fig. 10G,H, 94. Epandrium highly arched; surstyli elongated, curved inward, almost truncate at apex. Proctiger with scattered long setae. Ejaculatory apodeme fan-shaped lightly pigmented (Fig. 10J). Aedeagus as in Fig. 10I.

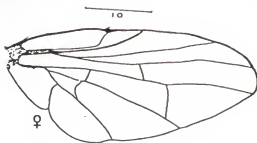
Holotype ♀, allotype, and 17 paratypes; Orange Co.: Orlando (holotype) 19-VI-1930; (allotype), 24-VI-1930; (paratype) 20♂ 1♀, 17-VI-1930, (paratype) 1♂ 1♀, 21-VI-1930; (paratype) 4♂ 2♀, 24-VI-1930;

Fig. 10 A-J Neaspilota floridana. A. lateral view of the head.
B. wing ♀. C. dorsal view of ovipositor sheath.
D. dorsal view of piercer of ♀ ovipositor. E. largest spicule of raspers. F. spermatheca. G. dorsal view of ♂ genitalia. H. profile view of ♂ genitalia. I. tip of aedeagus. J. ejaculatory apodeme.

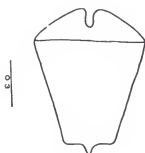


10

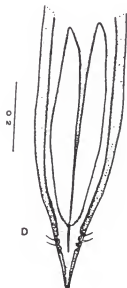
A



B



C



D



E



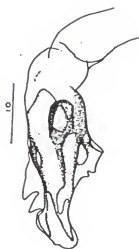
F



G

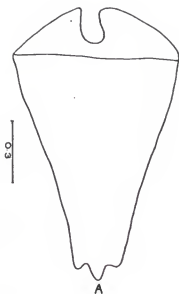


H



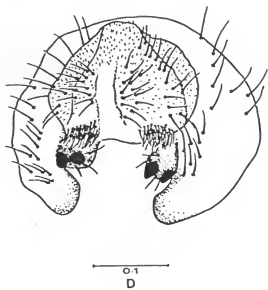
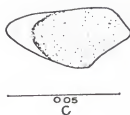
J

Fig. 11 A-E. Neaspilota alba (Loew). A. a dorsal view of ovipositor sheath. B. dorsal view of piercer of ♀ ovipositor. C. largest spicule of rasps. D. dorsal view of ♂ genitalia. E. profile view of ♂ genitalia.



11

0.3



0.1



(paratype) 2♂ 1♀, 2-VI-1930 (paratype) 2♂ 1♀, 5-VII-1930; holotype allotype, and paratypes are reared from Vernonia scaberrima Nutt., all collected by D. J. Nicholson; Charlotte Co.: Cleveland, (Paratype) 3♂ 5♀, bred from Vernonia blodgettii Small, 21-24-VI-1930 (Pope & White, USNM); Marion Co.: Ocala (paratype) 5♂, bred from Vernonia gigantea Walt.) Trel 14-VII-1930 (E. T. Evans & D. J. Nicholson, USNM), holotype and allotype No. 76488 in USNM. paratypes in USNM and FSCA.

Neaspilota foridana is very close to N. alba. The differences between them lie chiefly on the setae of the sides of the proctiger of the male genitalia of alba (Fig. 11D, E) the clusters of setae on floridana are much longer, paler, and less dense than in alba; the remainder of the proctiger in floridana bears longer setae than in alba, which makes the clusters less outstanding. The female ovipositor of alba, is much longer than floridana, about 2.9 mm long; the ovipositor sheath yellow tinged with brown on proximal end, much longer than floridana, approximately 1.2 mm long; the piercer narrow and apex gradually tapered to a point (Fig. 11B) measured about 0.8 mm long.

Neaspilota punctistigma Benjamin
Figs. 39, 93, 143

Neaspilota punctistigma Benjamin 1934. U.S. Dept. Agric. Tech. Bull. 104:35, Fig. 28. Holotype ♂. Type locality; Fort Christmas, Orange Co., Florida

Resembling Neaspilota dolosa by the almost hairy wing, by the shape of the fronto-facial angle, and by its bare frons. Differing from it by having the stigma with a distinct proximal as in Fig. 39 and by having the hind tibia of male with 2 erect preapical

setae that project ventrally. Abdomen entirely yellowish, dorsum heavily marked with brownish-black bands. Ovipositor long, 2.9 mm long, the sheath rufousbrown, about 1.1 mm long; the proximal end darkened. The piercer approximately 0.8 mm long with its apex thin and pointed. The male genitalia small and compact (Fig. 93). Epandrium highly arched, dorsum with 5 to 6 mm long brown setae. Surstyli broadly rounded at apex. Proc-tiger large, almost covering the apex of surstyli dorsally.

Length: body 2.6-3.0 mm; wing 2.3-2.7 mm. (N=8).

Hosts: Aster tortifolius Michx.

Chrysopsis graminifolia (Michx.) Ell.

Erigeron vernus (L.) Torr. & A. Gray

Heterotheca hyssopifolia (Nutt.) R. W. Long

Heterotheca mariana (L.) Shinnars

Heterotheca nervosa (Willd.) Shinnars var. microcephala
(Small) Shinnars

Heterotheca subaxillaries (Lam.) Britt. & Rusby

Heterotheca trichophylla (Nutt.) Shinnars

Heterotheca sp.

Hieracium gronovii L.

Pluchea foetida (L.) DC.

Distribution: Known only from Florida

Florida record: Alachua Co.: Gainesville, 1♂, 20-IV-1952

(O. Peck, CNC); 1♂ reared from Hieracium gronovii, 1-XI-1978 (I. B.

Rohani, FSCA); 2♂ 2♀, reared from Aster dumosus, 1-XI-1978 (I. B.

Rohani, FSCA); Micanopy, 5♂ 1+, reared from Heterotheca trichophylla,

21-26-VI-1930 (D. J. Nicholson, FSNM); Charlotte Co.: Charlotte, 4♂ 2♀

reared from Heterotheca trichophylla, 13-IV-1930 (Pope & White, USNM);

Hillsborough Co.: Tampa, 5♂ 2♀, Aster tortifolius, 26-28-IV-1930 (Pope & White, USNM); 2♀, reared from Heterotheca mariana, 10-VIII-1930 (F. S. Blanton, FSCA); Levy Co.: Bronson, 2♂ 1♀, reared from Pluchea foetida, 16-VI-1979 (I. B. Rohani, FSCA); Orange Co.: Bithlo, 5♂ 6♀, reared from Aster tortifolius, 6-17-VI-1930 (D. J. Nicholson, USNM); 6♂ 4♀, reared from Heterotheca trichophylla 21-VI-1930 (D. J. Nicholson, USNM), 5♂, reared from Aster tortifolius, 1-2-V-1930 (D. J. Nicholson, USNM), 2♂ 1♀, reared from Aster tortifolius, 29-VI-1930 (D. J. Nicholson, SNM); 3♂, reared from Pluchea foetida, 14-VII-1930 (D. J. Nicholson, USNM); Conway, 1♂ 2♀, reared from Aster tortifolius, 5-7-VII-1930 (D. F. Nicholson, USNM), Lockhart 10♂ 9♀, reared from Heterotheca hyssopifolia, 16-X-1930 (D. J. Nicholson, USNM); Orlando, 1♂ 2♀, Erigeron vernus, 2-V-1930 (F. S. Blanton, FSCA); 3♂, 9-V-1930 (F. S. Blanton, FSCA); 25♂ 13♀, reared from Erigeron vernus, 17-26-VI-1930 (D. J. Nicholson, USNM); 78♂ 36♀, reared from Heterotheca trichophylla, 17-26-VI-1930 (D. J. Nicholson, USNM); USNM; Orlovista, 3♂ 3♀, reared from Aster bifolius, 10-16-X-1930 (D. J. Nicholson, USNM) Orlovista 3♂ 2♀, reared from Heterotheca sp., 16-X-1930 (D. J. Nicholson, USNM); Pine Castle, 2♂ 6♀, 14-21-VI-1930 (D. J. Nicholson, USNM) Ft. Christmas, (Christmas), 17♂ 9♀, reared from Pluchea foetida, 5-30-VI-1930 (D. J. Nicholson, USNM); Orange & Seminole Co.: Golden Rod, 14♂ 6♀, reared from Heterotheca trichophylla, 30-VII;- 5-VII-1930 (D. J. Nicholson, USNM); Polk Co.: 4♂ 2♀, reared Heterotheca nervosa var. microcephala, 17-24-VI-1930 (Pope & White, USNM); Seminole Co.: Forest City, 15♂ 8♀, reared from Heterotheca trichophylla 30-VI-2-VII-1930 (D. J. Nicholson, USNM); Lake Mary, 8♂ 2♀, reared from Heterotheca trichophylla,

7-VII-1930 (D.J.Nicholson, USNM); Longwood, 15♂ 5♀, reared from Heterotheca trichophylla, 5-VII-1930 (D.J.Nicholson, USNM).

Johnson (1913) listed this species as Neaspilota signifera Coquillett. This species is an abundant and frequently encountered species in Florida. Habits are similar to those of other species in the genus. The larvae feed singly in the flower of various composites. Larvae and puparia are almost identical to those of achilleae (Benjamin, 1934).

Neaspilota vernoniae Loew
Figs. 40, 94

Trypeta vernoniae Loew, 1861. Berl. Entomol. Zeitsch.

5:346. Holotype ♀. Type locality: Pennsylvania.

A rather large species with an average length of 3.9 mm and has the following characteristics. Head yellow, frons pubescent. Thorax lemon yellow with whitish pubescence. Wing pattern as in Fig. 40, with several dark markings on the disc similar to that of achilleae except for the apical markings, reaching up to apex of vein M_{1+2} . Abdomen yellowish luteous with black hairs on the lateral margins and on the last segment. Ovipositor sheath rufous, tinged with dark brown at the distal tip, approximately 1.5 mm long. The piercer 1.5 mm long, apex abruptly tapered to a sharp point and with finely serrated margin. Extended ovipositor 3.8 mm long. Male genitalia as in Fig. 94. Epandrium narrow, with long fine setae dorsally. Surstyli broad, with truncate apices. Proctiger with long setae lateroventrally.

Length: body 3.5-4.4 mm; wing 3.4-4.0 mm. (N=5).

Hosts: Unknown for Florida species. In Kansas, Schwitzgebel and Wilbur (1943) reported Vernonia interior (Rydb.) as the host for the species.

Distribution: Michigan to Massachusetts, south to Kansas and Florida.

Florida Records: Foote (1965) indicated that the species was found in Florida, but no specific location was given. Nothing is known about the immature stages of this species. The specimens used in this study were obtained from Long Island, New York since no Florida materials were available.

Genus Paracantha Coquillett

Paracantha Coquillett, 1899, J. N.Y. Entomol. Soc.

7:254. Type species: Trypeta culta Wiedemann.

Members of this genus with distinctive wing pattern that easily distinguished them from other teplitids. All known species of Paracantha have the dark markings on the wings, ray-like in the margin, and cell R_5 with bulla always present. Head with conspicuous and contrasting black spots. Head and thorax ochraceous yellow, with strong black and yellowish-white bristles. Three pairs of upper fronto-orbital bristles set inside the line of lower fronto-orbital bristles. Dorsocentral bristles in front of supra-alars, closer to the transverse suture. Scutellum with 2 pairs of strong black bristles. Abdomen yellowish brown, tergites with numerous dark brown setae.

The larvae feed in the soft fleshy bases of the flowers of Compositae. The biology and identification of the immature stages of the 2 species recorded from Florida were discussed by Benjamin (1934). The genus contains 10 species and ranges from northern United States into Argentina, 5 species are Nearctic. Malloch (1941) reviewed the genus and included a key to 9 species.

Key to the Florida Species of *Paracantha*

1. Cell R_5 with 2 dark rays terminating on wing margin (Fig. 41); parafrontal spot anterior of eyes as large as 2nd antennal segment; fore femur with 1 black spot on posterior surface
 culta (Wiedemann)
- 1'. Cell R_5 with 3 dark rays terminating on wing margin (Fig. 42); parafrontal spot 1/3 size of 2nd antennal segment; fore femur with 2 black spots on posterior surface.
 forficula Benjamin

Paracantha culta (Wiedemann)
 Figs. 41, 95, 144

Trypeta culta Wiedemann, 1830, Auss. Zweifl. Ins. 2:486.
 Syntypes ♂ and ♀. Type locality: Savannah, Georgia (Corrected to culta in index p. 480.

Predominantly ~~ochraceous~~ yellow, very readily differentiated by the distinctive wing markings (Fig. 41), by the large subtriangular velvety black parafrontal spot and by having the

fore femur with 1 black spot on the posterior surface. Head similar in shape and bristling to other members of the genus, with 3 pairs of upper and lower fronto-orbitals. Closely resembling forficula, but the wing markings are distinctly different, with an incomplete fuscous streak in between the 2 dark rays in cell R_5 , also the front femora with only 1 black spot on its posterior surface. Ovipositor sheath long, about 2.8 mm. Piercer 2.3 mm long, slightly broadened just before the apex. Apex abruptly tapered to a sharp point. Extended ovipositor 7.4 mm long. Epan-drium ochraceous yellow with numerous long setae, lower inner margin sharply serrated (Fig. 95). Surstyli short and broadly rounded at apices.

Length: body 6.6-7.8 mm; wing 6.2-7.4 mm. (N=10).

Hosts: Carduus carolinianus Walt.

Carduus spinosissimus Walt.

Carduus nuttallii (DC.) Pollard

Carduus sp.

Distribution: Washington to Delaware, south to California and Florida.

Florida Records: Alachua Co.: 2♂ 3♀, 28-III-1940 (J. R. Watson, FSCA); 1♂, 8-V-1955 (H. V. Weems, Jr., FSCA); Archer 1♀, 23-III-1953 (H. F. Bowden, CNC); Gainesville, 2♂ 3♀, 21-III-1919 (G. B. Merrill, FSCA); 1♂, 20-III-1924 (J. S. Rogers, MCZ); 6♂ 4♀, bred from Carduus nuttallii, 29-30-V-1930 (D. J. Nicholson, USNM); 11♂ 2♀, bred from Carduus nuttallii, 4-10-VI-1930

(D. J. Nicholson, USNM); 1♂, 11-XV-1932 (T. H. Hubbell, MCZ);
 1♀, 24-III-1938 (A. N. Tissot, FSCA); Lochloosa, 1♀, 5-IV-1953
 (W. R. Mason, CNC); Baker Co.: Glen St. Mary, 1♀, on Carduus
spinosissimus, 12-IV-1960 (E. W. Holder, Jr., FSCA) 1♀, 15-IV-1960
 (E. W. Holder, FSCA); Macleenny, 1♀, reared from thistle (Carduus sp.)
 9-V-1960 (E. W. Holder, FSCA); Olustee, 9♂ 10♀, reared from
Carduus spinosissimus 20-IV-1-2-V-1979 (R. A. Belmont & I. B.
 Rohani, FSCA); 2♂ 2♀, reared from Carduus spinosissimus, 20-IV-1979
 (R. A. Belmont & I. B. Rohani, FSCA); 4♂ 3♀, reared from Carduus
spinosissimus, 10-V-1979 (R. A. Belmont & I. B. Rohani, FSCA);
 Clay Co.: Orange Park, 1♂, 29-IV-1967 (C. R. Zeiger, FSCA);
 Lake Co.: Tavares, 18♂ 17♀, bred from Carduus nuttallii, 27-V-1930
 (F. J. Nicholson, USNM); Orange Co.: Bithlq, 11♂ 22♀, reared from
Carduus spinosissimus, 13-V-1930 (D. J. Nicholson, USNM), Ft. Christmas
 (Christmas); 1♀, bred from Carduus spinosissimus, 17-V-1930 (D. J.
 Nicholson, USNM); Orlando, 5♂ 1♀, bred from Carduus sp., 3-V-1930
 (F. S. Blanton, FSCA); 2♂ 2♀, bred from Carduus sp., 9-10-V-1930
 (F. S. Blanton, FSCA); 32♂ 16♀, bred from Carduus spinosissimus,
 5-17-V-1930 (D. J. Nicholson, USNM); Osceola Co.: Deer Park,
 1♂ 1♀, Carduus spinosissimus, 13-V-1930 (D. J. Nicholson, USNM);
 Marion Co.: Ocala, 5♂ 4♀, 8-V-1930 (Woodruff, USNM). 2♂ 5♀, bred
 from Carduus nuttallii, 4-8-VI-1930 (D. J. Nicholson, USNM); Polk
 Co.: 3♂ 3♀, Carduus spinosissimus, 1-13-V-1930 (Pope & White,
 USNM); 8♂ 10♀, Carduus spinosissimus, 29-IV-1930 (Pope & White,
 USNM); St. Johns Co.: St. Augustine, 1♂, 21-V-1924 (C. W. Johnson,

MCZ); St. Lucie Co.: Fort Pierce, 2♂ 1♀, 9-VI-1938 (G. H. Baker, FSCA).

This species is commonly encountered in Carduus spinosissimus. Larvae pupated in flower head for 3-4 weeks before emerging to adults. Pupae black.

Paracantha forficula Benjamin
Figs. 42, 96, 145

Paracantha forficula Benjamin, 1934, U.S. Dept. Agric. Tech. Bull. 401:31, Fig. 23. Holotype ♂. Type locality: Cocoa Beach, Brevard Co., Florida (USNM).

A moderately large and distinctive species differentiated from other Paracantha by the wing markings (Fig. 42), by the characters on the head and male genitalia. Cell R₅ with 3 dark rays reaching the apical margin; hyaline spots in cells Cu₁ and 2nd A with dark margins. Head with smaller parafrontal black spots. Posterior surface of fore femora with 2 black spots. Ovipositor sheath short, about 1.6 mm long; piercer 1.1 mm. short and broad, apex abruptly tapered to a sharp end. Extended ovipositor 3.6 mm long. Epandrium with numerous long setae, the lower inner margin smooth. Surstyli short, with rounded apices.

Length: body 4.7-5.0 mm; wing 4.7-4.8 mm. (N=4).

Hosts: Borrichia frutescens (L.) DC.

Distribution: Known only from Florida

Florida Records: Brevard Co.: Cocoa Beach, 9♂ 14♀, bred from Borrichia frutescens, 16-31-VI-1930 (D. J. Nicholson, USNM); Merritt Islands, 8♂ 6♀, Borrichia frutescens, 19-V-1930 (D. J. Nicholson, USNM); Wilson, 1♂, bred from Borrichia frutescens, 21-X-1930 (D. J. Nicholson, USNM); Dade Co.: Miami, 2♂ 2♀, seed head of Borrichia frutescens, 11-VI-1966 (C. E. Stegmaier, USNM); Flagler Co.: Flagler Beach, 3♂ 1♀, bred from Borrichia frutescens, 19-V-1930 (F. S. Blanton, FSCA); Monroe Co.: Boca Chica, 1♂ 2♀, bred from Borrichia frutescens, 12-13-V-1930 (Pope & White, USNM); Marathon Key, 1♀, ex-Borrichia frutescens, 24-VI-1970 (C. E. Stegmaier, USNM).

Larvae breed singly in the flower head of Borrichia frutescens and about 3/4 the size of culta larvae (Benjamin, 1934). This species is very close to culta, but it is usually smaller, with an average length of 4.7 mm, with 2 dark marks on the fore femur and with a smaller parafrontal spot. Phillips (1923) erroneously figured the wing of forficula as culta. This species is not widespread and is rarely encountered in field collecting due to lack of good field work. Additional records were given by Stegmaier (1967).

Genus Peronyma Loew

Peronyma Loew, 1873, Smiths. Misc. Collect. 11(256):256.

Type species: Trypeta sarcinata Loew.

Readily differentiated from other known Florida tephritid by its oblique dark pattern on the wing, by the swollen bilobed

scutellum and by having only 1 pair of upper fronto-orbital bristles. Wing large and broad, with 4 dark brown oblique bands on hyaline background, 3 dark bands radiating from dark markings on costa, the apical band forked in cell R_5 forming 2 arms that extend to the posterior margin. Vein R_2 heavily setose, vein R_{4+5} setose beyond r-m crossvein. Mesonotum dark brown to black grayish pollinose with numerous short yellow setae. Pleurae and metathorax rufous. Bases of bristles with prominent black spots. Posterior nonopleuron black and greatly enlarged. Dorso-central bristles closer to a transverse line between supra-alar bristles than to a line between acrostichal bristles. Scutellum dark brown medially and swollen, with black marking dorsolaterally, and with 1 pair of scutellars. Legs brown. Abdomen dark brown to black with numerous short brown setae.

Nothing is known about the biology of the species.

The genus contains only 1 species, which is restricted to south-eastern United States.

Peronyma sarcinata Loew

Figs. 43, 97, 146

Trypeta sarcinata Loew, 1862, Berlin. Entomol. Zeitschr.

6:218. Holotype ♀. Type locality: Carolina.

Mostly dark brown species with swollen bilobed scutellum. Head and thoracic bristles black. Head yellowish-brown with black spots on parafacial region. Only 1 pair of upper fronto-orbital bristles and 2 pairs of lower fronto-orbital bristles present. Thorax with a pair of submedian black spots situated on the

transverse suture; posterior notopleuron swollen and darkened. A pair of submedian strips extending length of mesonotum. Dorsum of thorax and scutellum with numerous short, stout yellow setae. Wing pattern as in Fig. 43. Node of vein R_2 and posterior 1/2 of stigma with rufous markings. Wing predominantly brown, the apical bend forked in cell R_5 . Costal margin of the dark band more or less serrated. Proximal anal areas dark brown except for a hyaline area in cell Cu_1 . Abdomen dark brown with numerous dark setae. Female ovipositor long, about 6.5 mm. The ovipositor sheath 2.5 mm, dark brown with numerous dark brown to black setae, the distal tip tinged with black. The piercer long and slender, about 1.9 mm long, apex tapered gradually to a sharp point. The male genitalia as in Fig. 97. Epandrium black with dense long black setae dorsolaterally. Surstyli broad, apices truncate. Proctiger small and elongate, with numerous fine setae dorsally and lateroventrally.

Length: body 4.5-6.0 mm; wing 5.0-6.5 mm. (N=5).

Hosts: Heterotheca trichophylla Nutt.

Distribution: North Carolina, south to Alabama and Florida.

Florida Records: Orange Co.: Apopka, 1 $\frac{0}{7}$, reared from galls on crown growth of Heterotheca trichophylla, 22-I-1931 (T. B. Kline & E. T. Evans, USNM); Bithlo, 1 $\frac{0}{8}$, reared from larvae from crown growth of Heterotheca trichophylla, 13-I-1931 (D. J. Nicholson, USNM).

This species is sparsely distributed in Florida. Larvae feed on various parts of the host plant, Heterotheca trichophylla. The immature stages were discussed by Benjamin (1934).

Genus Procecidochares Hendel

Procecidoshares Hendel, 1941, Wien. Entomol. Zeitschr.

33:91. Type species: Trypeta atra Loew.

Predominantly black with distinct dark bands on wing.

Easily differentiated from other Oedespinae by having a swollen, shining black scutellum and contrasting yellowish-white mesonotal hairs. Head and body bristles black. Only 1 pair of upper fronto-orbital bristles. One pair of dorsocentral bristles always situated immediately behind the transverse suture, presutural dorsocentrals sometimes absent. Scutellum with 2 pairs of long bristles. Wing hyaline, with dark brown to black basal spot and 3 transverse to oblique bands. The proximal 2 bands connected to each other to form a broad inverted V-band, the oblique distal band lies close to costa. The abdomen densely covered with yellowish long setae usually intermixed with darker setae.

The wing pattern, head structure and mesonotal adornments are similar to members of the genus Procecidocharoides, a rather distantly related genus within the same subfamily. The genus is largely North American with 3 of 9 known species occurring in Florida. Little is known of the species, many are gallmakers on various plants;

principally Artemissia, Chrysothamnus, Grindellia Solidago sp. (Foote, 1960b). The latest complete revision of the genus is that by Aldrich (1929).

Key to the Florida Species of Procecidochares

1. Two pairs of dorsocentral bristles, 1 anterior and 1 posterior to the suture; legs with femora black 2
- 1'. One pair of dorsocentral bristles, always posterior to the suture; legs wholly yellow. polita Loew
2. Acrostichal seta running into a large group of setae before the suture, filling the space between the dorsocentrals; the distal dark band touches the apical margin just anterior of vein R_{4+5} australis Aldrich
- 2'. Acrostichal setae in a single or double row anteriorly; the distal dark band touches the apical margin behind the vein M_{1+2} atra Loew

Procecidochares atra Loew

Figs. 44, 98

Trypeta atra Loew, 1862, Berlin Entomol. Zeitsch. 6:210.

Holotype ♂. Type locality: New York.

Differentiated from all known Florida Procecidochares by having the following characters: thorax black, with round polished areas on each side between dorsocentral bristles and notopleurae surrounded by 1 or 2 rows of flattened white setae; with 2 rows of white acrostichal setae. Two pairs of dorsocentral bristles

present, 1 anterior of the transverse suture and the posterior to it. Legs yellow except for femorae, tinged with black. Wing pattern as in Fig. 44; with 3 dark brown bands. The 2 proximal bands connected anteriorly to form an inverted V-band that extends to anal wing margin; the oblique distal band reaching the apical wing margin behind vein M_{1+2} and separated from the proximal band. Abdomen black, the dorsum covered with white setae intermixed with distinct black hairs. Female ovipositor long, approximately 3.0 mm. Ovipositor sheath black, dorsum covered with numerous black hairs, about 1.5 mm long. Piercer about 1.2 mm long, gradually pointed at apex. Male genitalia black and small is in Fig. 98. Epandrium highly arched, dorsum narrow and covered with long black setae. Numerous short setae are found laterally. Surstyli broad and slightly curved inward, apex rounded. Proctotiger small, elongate with numerous long fine setae lateroventrally.

Length: body 3.0-4.0 mm; wing 2.7-3.0 mm. (N=5).

Hosts: No host information for Florida specimens. Known to be reared from galls on Solidago in Virginia.

Distribution: Kansas to Maine; south to Florida.

Florida Records: Only those of Johnson (1913): Duval Co.: Atlantic Beach.

This species is known to inhabit galls of various species of golden rod. Phillips (1946) discussed the morphology of the of the larvae. This species is distinguished from australis by the distal band which touches the apical margin of wing at vein M_{1+2}

Procedidochares australis Aldrich
Figs. 45, 99, 147

Procedidochares australis Aldrich, 1929, Proc. U.S. Nat. Mus. 76:9. Holotype ♀. Waco, Texas (USNM).

Closely resembles atra in having 2 pairs of dorsocentral bristles and black femora. Differing from the latter by its wing pattern and by the characters on the thorax and abdominal terga. Mesonotal areas between dorsocentral bristles with numerous short blunt golden setae. The distal band of wing connected to inverted V-band at apical 1/3 of vein R_{4+5} and touches apical margin just anterior of vein $_{4+5}$ (Fig. 45). Ovipositor sheath shining black with numerous black hairs, approximately 1.6 mm long, Piercer long and slender, about 1.1 mm; apex gradually tapers to a sharp point. Extended ovipositor 3.0 mm long. Male genitalia as in Fig. 99. Epandrium wide with long fine setae on the dorsum. Surstyli elongate and curved slightly inward, tip blunt. Pro-tiger elongate with few setae at apex.

Length: body 2.0-4.6 mm; wing 3.0-3.3 mm. (N=12).

Hosts: Conyza canadensis (L.) Conquist

Heterotheca subaxillaries (Lam.) Britt. & Rusby

Distribution: Texas, South Carolina and Florida.

Florida Record: Alachua Co.: 1♂, 24-IX-1954 (H. V.

Weems, Jr., USNM); Gainesville, 2♀, reared ex-Heterotheca subaxillaries, 14-X-1978 (I. B. Rohani, FSCA), 1♂ 1♀, reared

Heterotheca subaxillaries, 13-21-X-1979 (I. B. Rohani, FSCA); Bay Co.:

Panama City, 1♂, 19-X-1930 (F. S. Blanton, USNM); Dade Co.: Miami, 1♂, 27-IV-1973 (W. H. Pierce, FSCA); 1♂, 27-IV-1973 (W. H. Pierce, FSCA); Lake Co.: Altoona, 1♂, in fruit fly trap. 14-III-1966 (C. L. Felshaw, USNM); Marion Co., Ocala, 1♂, 5-XI-1932 (F. S. Blanton, USNM); 1♀, swept Heterotheca aubaxillaries, 30-VIII-19/8 (I. B. Rohani, FSCA); Orange Co., Orlando, 1♂, Heterotheca subaxillaries, 29-V-1930 (C. F. Benjamin, USNM); 1♀, bred from Heterotheca subaxillaries, 22-VII-1930 (D. J. Nicholson, USNM); 1♀, bred from Heterotheca subaxillaries, 30-VII-1930 (D. J. Nicholson, USNM); 16♂, bred from Heterotheca subaxillaries, 21-VIII-1930 (D. J. Nicholson, USNM); 1♂, bred from Heterotheca subaxillaries, 28-VIII-1930 (D. J. Nicholson, USNM) 10♂, ex Heterotheca subaxillaries, 12-15-V-1931 (D. J. Nicholson, USNM); 1♀, galls on Heterotheca subaxillaries, V-1931 (USNM), 1♀, grass weeds, 4-VIII-1948 (O. D. Link, USNM); Orlóvista; 1♂ 1♀, Heterotheca subaxillaries, 9-11-IX-1930 (D. J. Nicholson, USNM); Pine Castle, 2♂, bred from Heterotheca subaxillaries, 27-VIII-1930 (D. J. Nicholson, USNM); Pasco Co.: Hudson, 1♂, 13-VII-1939 (I. B. Beamer, USNM) Putnam Co., Palatka, 1♀, reared from Heterotheca subaxillaries, 19-IX-1978 (I. B. Rohani, FSCA); St. Johns Co., Crescent Beach, 9♂ 2♀, on Yucca aloifolia, 21-III-1974 (W. H. Pierce, FSCA).

Most of the available specimens do not have the distal band connected to the V-band on vein $R_4 + 5$, thus having a wing pattern similar to that of polita Loew. It can be distinguished from polita by having the hyaline areas on the anal margin of the

wing equal in width to 2nd proximal band. This species is commonly reared from Heterotheca subaxillaries, the larvae caused galls on the flower buds. Benjamin(1934) described the immature stages of this species. Phillips (1946) briefly discussed the biology and described in detail the morphology of the larva.

Procecidochares polita Loew
Figs. 46, 148

Trypeta polita Loew, 1862, Smiths. Misc. Collect. 6(1):77, pl. II. Fig. 12. Holotype ♀. Type locality: Washington (MCZ).

Readily differentiated from other Procecidochares by having only 1 pair of dorsocentral bristles posterior of the transverse suture and by having the femora extensively yellow. The hyaline area in cell 2nd M_2 separating the distal dark band from V-band about 2 times the width of the 2nd brown band. The distal band touched the apical wing margin just anterior of vein $M_1 + 2$. Abdomen black and rather densely covered with white setae. Ovipositor sheath black, dorsum with numerous black setae, approximately 1.7 mm long. The piercer long and straight, measures about 1.3 mm long, with apex tapers gradually to a pointed end. Extended ovipositor measure 4.2 mm long. Male genitalia small. Epandrium highly arched and wide, with numerous fine black setae. Surstyli elongate, slightly curved inward with more or less rounded apices. Protiger elongate with numerous long and fine setae lateroventrally.

Length: body 3.5-4.6 mm; wing 3.3-3.5 mm. (N=3).

Hosts: Solidago stricta Ait.

Solidago sp.

Distribution: Kansas to Massachusetts, south to Mississippi and Florida.

Florida Records: Dade Co.: Hialeah, 3♂ 2♀, ex-stem gall Solidago stricta, 12-XI-1970 (C. E. Stegmaier, USNM); 1♂ 1♀, galls Solidago sp., 25-VI-1971 (C. E. Stegmaier, USNM); Miami, 1♂ 2♀, 21-VIII-1924 (S. Graenicher, USNM).

Not much is known about the biology of the immature stages of this species. The species causes galls on Solidago sp. This species may be recognized by the absence of a presutural dorso-central bristles and by the shining pleural tergites. Detailed description was given by Loew (1862).

Genus Rhagoletis Loew

Rhagoletis Loew, 1862. Europ. Bohrf., p. 44. Type species: Musca cerasi Linnaeus.

Predominantly black with yellow marking on bodies; can be distinguished by the following characters: Head slightly broad; 3rd antennal segment with distinct apicodorsal point, with 2 pairs of upper fronto-orbitals and 3 pairs of convergent lower fronto-orbitals. Thorax light yellow to black with short decumbent thin setae and yellow pollinose microtrichia. Dorsocentral bristles closer to a line between supra-alar bristles than to a transverse suture. Notopleural stripe yellow, extending from

humeral callus to wing base. Scutellar with 2 pairs of scutellars. Wing pattern consisting of transverse yellow to brownish-black bands. Crossvein r-m near the center of 1st M₂. Vein R₁ setolose. over entire length. Posterior margin of abdominal tergites with white pollinose bands; bands can be entirely absent or greatly reduced.

The larvae of all species feed on the fleshy pulp of fruits and berries. Bush (1966), in his revision of the genus, noted the degree of host specificity. Although most species are probably oligophagous, some species show a definite preference for certain host species within a genus or even for particular varieties of a single species. The genus occurs in Europe and North, Central, and South America. The population center of the genus, however, is North America. Of the 18 known species from North America, 6 species are known from Florida. Four of the 6 species are sibling species and present special problems in identification.

A comprehensive review of the North American species was given by Cresson (1929). Curran (1932?) provided a key to several species. Pickett (1937) reviewed the genus and provided additional information on the taxonomic status of some species. The latest taxonomic work on the genus is that of Bush (1966).

Key to the Florida Species of Rhagoletis

1. Wing with apical band forked (Fig. 48, 49) or upper prong of fork separated from it by a hyaline area (Fig. 47) medial band separated from basal and subapical bands; F-shaped pattern of wing not prominent, surstyli with apical tuft of long setae cingulata group. . . . 2
- 1'. Wing with apical band entire (Fig. 50, 51, 52); medial band jointed to basal and subapical band; F-shaped pattern prominent surstyli without apical tuft of setae.
. pomonella group. . . . 4
2. Apical band of wing with incomplete fork, upper prong separated from band by a hyaline area, usually associated with Prunus serotina Ehrh. (Rosaceae). . . . cingulata (Loew). . . . 4
- 2'. Apical band of wing with a complete fork, infesting other host plants (Oleaceae). 3
3. Average thoracic length 2.0 mm; larvae infest Chionanthus virginicus L. chionanthi Bush
- 3'. Average thoracic length 2.2 mm; larvae infest Osmanthus americanus (L.) Gray. osmanthi Bush
4. Thoracic length varies from 1.8-2.2 mm; larvae infest only fruits of the subfamily Pomoidea (Rosaceae).
. pomonella Walsh
- 4'. Thoracic length varies from 1.4-2.1 mm; larvae infest fruits of host plant of the families Ericaceae and Cornaceae.
. 5

5. Thoracic length ranges from 1.5-2.1 mm; larvae only in
fruits of Cornus florida (Cornaceae).
. cornivora Bush
- 5'. Thoracic length ranges from 1.4-1.7 mm; larvae only in
Vaccinium arboreum Marsh. and Vaccinium formosum Andr.
. mendax Curran

Rhagoletis cingulata cingulata (Loew)

Figs. 47, 100, 149

Trypeta cingulata Loew, 1862, Smiths Misc. Collect. 6(1):76.

Holotype ♀. Type locality: Middle state.

Readily differentiated from the sibling species, chionanthi and osmanthi by the fuscous apical spot on the wing, by the head and body measurement, and by the ovipositor length. Predominantly dark brown, with yellowish head. Thorax dark brown with whitish pollinose microtrichia and decumbent setae arranged in 4 ill-defined rows. Dorsocentral bristles on a line drawn between anterior supra-alars. Scutellum dark brown with large dorsoapical white spot, with 2 pairs of scutellars. Notopleural stripe white extending from humeral to wing base. Legs yellow, sometimes tinged with brown. Wing pattern as in Fig. 47, with upper arm of apical fork broken by hyaline area. Female ovipositor short, about 2.4 mm; the ovipositor sheath dark brown to black, as long as broad about 0.8 mm. The piercer 0.8 mm, apex gradually tapers to a sharp point. Male genitalia as in Fig. 100. Epandrium with long

fine setae on dorsum. Surstyli long and slender, apex with a tuft of short setae; apices rounded. Proctiger small and elongate with scattered setae lateroventrally.

Lenth: body 4-4.6 mm; wing 3.8-3.9 mm. (N=8).

Hosts: Prunus serotina. Ehrh.

Distribution: Michigan to New Hampshire, south to Florida.

Florida Records: Alachua Co.: Gainesville, 1♀, bred from Prunus serotina, 23-IV-1931 (D. J. Nicholson, USNM); 1♂, bred from Prunus serotina, 1-9V-1931 (E. T. Evans & D. J. Nicholson, USNM); 5♂, bred from Prunus serotina, 21-23-V-1931 (D. J. Nicholson, USNM); Duval Co.: Jacksonville, 1♀, Insect flight trap, 10-VI-1964 (L. W. Taylor, FSCA); Hillsborough Co.: Plant City, 2♂ 5♀, Insect flight trap, 29-V-1967 (D. A. Vaughan, FSCA); Tampa, 1♀, 10-IV-1957 H. V. Weems, Jr., FSCA); 4♂, insect flight trap, 14-V-1965 (S. A. Fuller, FSCA); Lake Co.: Leesburg, 1♂, 14-IV-1962 (C. L. Felshaw, FSCA); Orange Co.: Plymouth, 4♂, bred from Prunus serotina 3-4-V-1931 (W. S. Earle, USNM) 33♂, bred from Prunus serotina 6-12-V-1931 (W. S. Earle, USNM); 80♂ 12♀, bred from Prunus serotina 1-12-V-1931 (W. S. Earle, USNM); 10♂, bred from Prunus serotina 10-12-V-1931 (W. S. Earle, USNM); Tangerine, 12♂, sweeping on Prunus serotina, 14-V-1929 (G. B. Merrill, USNM); Volusia Co.: near Osteen, 1♀, caught in the field, 1930 (E. Pell, USNM);

R. c. cingulata is the Florida member of the genus in which the apical margin of the wing has a fuscous spot. Bush (1966) discussed the diagnostic characters distinguishing cingulata from

indifferences. There is apparently little or no overlap in the ovipositor length of this species and that of osmanthi Bush. Blanc and Keifer (1955) discussed the taxonomy and host relationships of the 2 geographical populations of Rhagoletis cingulata in North America. The larva is a well known pest of cultivated cherries; however, this host is not present in Florida. Benjamin (1934) and Phillips (1946) and Weems (1972) discussed larval morphology and biology of the species.

Rhagoletis chionanthi Bush
Figs. 48, 151

Rhagoletis chionanthi Bush, 1966, Bull. Mus. Comp. Zool. 134(11):482. Holotype ♀. Type locality: Apopka, Florida (USNM).

Bush (1966) gave the following diagnosis for separating chionanthi from the closely related osmanthi, 1) the mean length of the female ovipositor, chionanthi (0.95mm) and osmanthi (1.05mm), 2) a difference in host preference and emergence period. The emergence is synchronized to coincide with ripening of the fruits of Chionanthus virginicus L. Wing pattern as in Fig. 28. The female ovipositor and male genitalia are not available for dissection.

Hosts: Chionanthus virginicus L.

Distribution: Georgia, Florida.

Florida Records: Orange Co.: 1♂ 1♀, reared from Chionanthus virginicus, 30-IV-1930 (A. H. Reppard, USNM); 2♂, bred from Chionanthus virginicus, 10-13-V-1931 (A. H. Reppard, USNM); 3♂, bred from Chionanthus virginicus, 15-16-V-1931 (A. H. Reppard, USNM); Apopka, 4♂ 1♀, bred from Chionanthus virginicus, 12-IX-1929 (W. S. Earl, USNM);

Osceola Co.: Kissimmee, 7♂ 8♀, bred from fruits Chionanthus virginicus, 15-30-VIII-1930 (G. F. Harding, USNM); 3♂ 2♀, bred from Chionanthus virginicus, 5-26-V-1931 (G. F. Harding, USNM); (paratypes) 6♂ 1♀, bred from Chionanthus virginicus, 15-26-V-1931 (G. F. Harding, USNM).

Rhagoletis chionanthi fits the description of the cingulata group except for the ovipositor length. It can be distinguished easily from the northeastern specimens of cingulata on the basis of color pattern, but in Florida cingulata, osmanthi, and chionanthi are so similar, it is impossible to separate them on the basis of color alone. Bush (1966) gave detailed discussion of the character difference between these sibling species.

Rhagoletis osmanthi Bush

Figs. 49, 101, 151

Rhagoletis osmanthi Bush, 1966, Bull. Mus. Comp. Zool., 134(11):478. Holotype ♂. Type locality: Osceola Co.: Florida (USNM).

A small to medium dark brown species with a distinct apical fork on the wing. Mesonotum with cream to light yellow pollinose microtrichia and decumbent setae arranged in 4 ill-defined rows belong to cingulata group, can be differentiated from cingulata cingulata (Loew) by the following characters as described by Bush (1966); presence of a forked apical wing band; with a longer piercer 0.8 mm; considerably larger thoracic length

ranges 19.2 mm; and by host preference, infests only Osmanthus americanus (L.) Gray. Female ovipositor short, about 2.6 mm; the ovipositor sheath dark brown, about 0.9 mm long. The piercer 0.9 mm, apex, gradually tapers to a sharp point. Epandrium with long fine setae dorsally. Surstyli elongate, apex rounded and with a tuft of long fine setae. Proctiger similar to others in the group (Fig. 101).

Length: body 3.6-4.0 mm; wing 3.6-3.8 mm. (N=8).

Hosts: Osmanthus americanus (L.) Gray

Distribution: Known only from Florida.

Florida Records: Hillsborough Co.: (paratype) 1♂, bred from Osmanthus americanus, 28-X-1930 (Pope & White, USNM); 3♂ bred from Osmanthus americanus, 28-X-1930 (Pope & White USNM); 3♂, bred from Osmanthus americanus, 5-21-XI-1930 (B. G. Anderson, USNM); Seffner, 1♂ 3♀, bred from Osmanthus americanus, 10-X-1930 (Pope & White, USNM); Thonotossas, 1♂ 1♀, bred from Osmanthus americanus, 5-XII-1930 (W. H. Pope, USNM) Osceola Co.: Alligator Lake, 10♂ 3♀, bred from Osmanthus americanus, 3-10-XI-1930 (W. C. Slight, USNM); (paratypes) 3♂ 5♀, bred from Osmanthus americanus, 18-XI-1930 (W. C. Slight, USNM); Pasco Co.: New Port Richey, 5♂ 3♀, bred from Osmanthus americanus, 3-XI-1930 (G. G. Norman, USNM); Pinellas Co.: Tarpon Springs, 10♂ 2♀, bred from Osmanthus americanus, 19-XI-1930 (M. Dodd, USNM); Volusia Co.: 1♂, bred from Osmanthus americanus, 19-III-1930 (M. Dodd, USNM); Coronado, 2♂, bred from Osmanthus americanus, 10-18-IX-1930 (Crew, USNM).

This species, as well as the closely related chionanthi, is more extensively marked with yellow than the northeastern population of cingulata. However, it is difficult to differentiate between the Florida representatives of the cingulata group as they have similar color patterns. It is more difficult to differentiate osmanthi from chionanthi as both have a forked apical wing band; however, osmanthi is slightly larger and can be allochronically isolated from the latter. Bush (1966) discussed the diagnostic characters of this species.

Rhagoletis pomonella (Walsh)
Figs. 50, 102, 152

Trypeta pomonella Walsh, 1967, Amer. J. Hort. 2:343.

Lectotype ♀. No locality (MCZ).

Differentiated from other known Rhagoletis by the wing pattern (Fig. 50) and bicolored halteres. The medial band of wing connected to apical band in cell R_1 and R_2 , and to subapical band in cell R_5 and part of cell 1st M_2 . Hyaline area between apical band and costa narrow at junction of R_1 and costa, but broadening posteriorly. Anterior margin of apical band smooth or broken in step-like fashion. The medial band broadly joined the basal band along Cu_2 + 2nd A. Thorax black, dorsum with numerous white short setae and white pollinose microtrichia 2 long submedian bands. Submedian bands extend from anterior margin of mesonotum and posteriorly to a point in line with base

of prescutellars. The median bands short, separated by a wide black band and reaching only to a point midway between dorso-centrals and prescutellars. Legs yellow tinged with brown. Abdomen black; tergites II-IV with white pollinose band along posterior margin. Female ovipositor short, about 2.5 mm; ovipositor sheath dark brown to black with numerous black setae, 0.1 mm long. The piercer slender, apex gradually tapers to a point, 0.9 mm long. Male genitalia as in Fig. 50. Epandrium black with scattered setae dorsolaterally. Surstyli slender and elongate with more or less rounded apices. Proctiger elongate with scattered setae.

Length: body 4.2-4.6 mm; wing 3.8-4.2 mm. (N=10).

Hosts: Aronia arbutifolia (L.) Pers.

Crataegus maloides Sarg.

Crataegus sp.

Prunus angustifolia Marsh.

Prunus umbellata Ell.

Prunus sp.

Distribution: east of North Dakota to Nova Scotia, south to east Texas and Florida.

Florida Records: Alachua Co.: Ascot, 1♀, Wild Plum 11-XII-1930 (C. B. M. FSCA); 2♂, puparia under wild plum, 10-12-VII-1930 (USNM); 1♂, bred from Prunus angustifolia, 18-20-V-1931 (E. T. Evans & D. J. Nicholson, USNM); 3♂, bred from Prunus angustifolia, 1-4-V-1931 (E. T. Evans & D. J. Nicholson,

USNM); 4♂ 1♀, bred from puparia from soils under Prunus sp.
 14-16-V-1931 (E. T. Evans, USNM); 3♂, bred from Prunus sp.,
 12-23-V-1931 (E. T. Evans & D. J. Nicholson, USNM); Gainesville,
 1♂, trap by window, 7-X-1956 (H. V. Weems, Jr.; FSCA); 1♂, 23-X-
 1965 (H. V. Weems, Jr., FSCA); Hamilton Co.: Jasper, 6♂ 2♀, bred
 from Crataegis maloides, 21-X-1939 (J. E. Graves & D. J. Nicholson,
 USNM); Hillsborough Co.: Tampa, 1♂ 1♀, stickyboard trap, 12-XI-1965
 (T. J. Ravordso, FSCA); 1♂ 1♀, stickyboard trap, 29-XI-1965 (T. J.
 Ravordso, FSCA); Levy Co.: Chiefland, 3♂ 1♀, 29-V-1930 (McGlamery,
 USNM); Liberty Co.: Torreya State Park, 1♀, insect flight trap,
 5-VII-1965 (H. V. Weems, Jr., FSCA); Marion Co.: Belleview, 11♂,
 sparkleberry, 5-9-VI-1930 (F. Walker, SUNM).

The relationships of Rhagoletis species, cornivora
mendax and pomonella have been the subject of dispute. They
 have nearly identical wing pattern and other external morpho-
 logical features that show considerable overlap. However,
 important constant differences in surstyli, overall size between
 these 3 species, and for the biological reasons stated by Bush
 (1966), these species are considered as distinct species.
 This species is only locally common in Florida and apparently
 restricted to the northern 1/2 of the state. Bush (1966)
 discussed the taxonomic status and listed the known hymenopterous
 parasites and host plants of this species. The immature stages
 have been described by Illingworth (1912), Snodgrass (1924),
 Benjamin (1934), and Phillips (1946).

Rhagoletis cornivora Bush
Figs. 51, 154

Rhagoletis cornivora Bush, 1966, Bull. Mus. Comp. Zool., 134(11):470. Holotype ♂. Type locality: Lincoln, Mass. (MCZ).

Resembling other sympatric members of the pomonella group (mendax Curran and pomonella Walsh) in most respects, except for the shape and size of surstyli, ovipositor length, and host preference (Bush 1966). Predominantly black with white to yellow pollinose band along the margin of tergites II-IV. Halteres bicolored. Wing pattern similar to those of pomonella (Walsh) (Fig. 51). Ovipositor short, approximately 2.5 mm. Ovipositor sheath dark brown to black, about 0.9 mm long. Piercer 0.8 mm long, apex pointed gradually to a sharp point. Male genitalia not dissected. Epan-drium dark brown, dorsum with few long brown setae. Surstyli long and slender, apices with rounded tip. Proctiger moderately long and elongate, with scattered setae lateroventrally.

Length: body 4.0-4.6 mm; wing 3.8-4.0 mm. (N=4).

Hosts: Cornus florida L.

Distribution: Florida, Maine, Massachusetts.

Florida Records: Levy Co.: Williston, 1♂, bred from Cornus florida, 11-X-1930 (M. Dodd, USNM), Polk Co., Lakeland, 7♂ 1♀, bred from Cornus florida, 6-9-XI-1930 (Pope & White, USNM); 3♂ 1♀, bred from Cornis florida, 16-X-1930 (Pope & White, USNM).

The wing pattern of this species is identical to that of pomonella and mendax. Although Rhagoletis cornivora may be

distinguished from other sympatric members of the pomonella group north of Georgia by the surstyli shape and ratio, ovipositor length and host preference; females of Florida population of cornivora cannot be distinguished from mendax or pomonella without host data (Bush, 1966). Host data is the only sure way of differentiating cornivora.

Rhagoletis mendax Curran
Figs. 52, 103, 154

Rhagoletis mendax Curran, 1932. Amer. Mus. Nov. 526:6-7.

Holotype ♂. Type locality: Maine (AMNH).

Belonging to the pomonella group and can be differentiated from Florida cornivora and pomonella by the shape and angle of surstyli and on the basis of host preference. Female ovipositor 2.5 mm long; ovipositor sheath dark 0.9 mm. The piercer long and very sharp at apex, 0.8 mm long. Male genitalia as in Fig. 103. Epandrium dark brown to black, with scattered long setae. Surstyli narrow and slender, apices more or less rounded. Proctiger small and elongate with few setae lateroventrally.

Hosts: Vaccinium arboreum Marsh

Vaccinium formosum Andr.

Distribution: Primarily restricted to northeastern United States and southeastern Canada.

Florida Records: Hillsborough Co.: Plant City, 3♂ 1♀
Vaccinium arboreum, 4-8-X-1929 (W. D. White, USNM); 2♂, on sparkleberry 15-X-1929 (W. D. White, USNM); 1♂, on sparkleberry 21-X-1929

(W. D. White, USNM), Tampa, 1♂, bred from Vaccinium arboreum, 6-X-1930 (F. S. Blanton, FSCA); 7♂, bred from Vaccinium arboreum 10-X-1930 (F. S. Blanton, FSCA); Levy Co.: Chiefland, 2♂ 1♀, 14-V-1930 (M. S. Glameny, USNM); 1♂, bred from Vaccinium arboreum, 1-3-X-1930 (H. Hammond, USNM); Marion Co.: Belleview, 2♂, bred from sparkleberry, 16-XI-1929 (F. Walker, USNM). Putnam Co.: 1♀, bred from Vaccinium arboreum, 14-X-1930 (USNM).

Although mendax, pomonella, and cornivora resemble each other closely, there are constant differences between these species. Bush (1966) stated that the surstyli differs markedly and that mendax has different host requirements. Females, however, possess no morphological characters that separate them from females of pomonella and cornivora. In Florida, the adults of mendax have been reared from 2 species of Vaccinium only. Woods (1915), Lathrop and Nickles (1932), and Hall (1943) reviewed the biology and the host relationship of this species.

Genus Stenopa Loew

Stenopa Loew, 1873. Smiths. Misc. Collect. 11(256):234.

Type species: Trypeta vulnerata Loew.

Readily differentiated from other Tephritinae by its dark body and by the distinctive banding of the wing. Head rather narrow, much higher than long, with numerous stout hairs. Genae and parafrontal yellowish white, densely white tomentose. Front narrow ochraceous yellow. Two pairs of upper fronto-orbitals

inside the line of lower fronto-orbitals, the posterior pair pale and stout. Three pairs of lower fronto-orbital bristles. Head and thoracic bristles strong and black. Arista long and plumose. Thorax predominantly black with whitish hairs. Dorsocentral bristles closer to transverse suture than to a line between supra-alar bristles. Scutellum shining black with 4 strong bristles. Legs largely yellow with brown to black markings on the mid and hind femora. Wings broad and typically with dark bands on hyaline field. Abdomen dark brown to black on hyaline field.

Presently the genus contains 2 species, with only 1 species reported from Florida. Both species are relatively rare. Not much is known about the biology of the species except for Stenopa vulnerata (Loew), which breeds on Senecio aureus L. Novak and Foote (1975) presented the key to adults.

Stenopa vulnerata (Loew)
Figs. 53, 104

Trypeta vulnerata Loew 1873, Smiths. Misc. Collect.
11(256):232. Holotype ♀. Type locality: Massachusetts.

Moderately large species with an average of 5.6 mm and with distinct wing pattern (Fig. 53) and shape of the head. Wing broad, with black bands on a hyaline field. Wing pattern consists of an S-shaped band; the forked proximal loop of S-band elongate basally extending to humeral area, also connected to a dark marking at the base of wing. The distal loop with subapical

arm, forming an F-shaped marking, widens posteriorly, extending from just anterior of vein $R_2 + 3$ to apical margin. The hyaline cross band on the disc, at least to the middle of cell 1st M_2 , r-m crossvein situated near the center of cell 1st M_2 . Vein $R_4 + 5$ bare and undulating, curving toward vein $M_1 + 2$. Head typically higher than long, eyes more or less oval and 2 times higher than long. Frons narrow, ochraceous yellow with a faint brown vittae in the middle. Scutellum shining black, greatly swollen with 4 scutellars. Female ovipositor long, about 4.6 mm. Ovipositor sheath dark brown to black with numerous short black setae, about 1.7 mm. long. The piercer long and slender, about 1.5 mm, evenly tapered to a sharp point at apex, with minutely serrated margin. Male genitalia as in Fig. 104. Epan-drium broad and black dorsum with numerous long setae, Surstyli broad and developed into 2 short rounded lobes at apices; the upper lobes with dense short setae; lower lobes with more or less truncate apical margin. Proctiger small, yellow, and elongate, with numerous long fine setae lateroventrally.

Length: body 5-6.5 mm; wing 5-6.5 mm. (N=10).

Host: Unknown for Florida species

Senecio aureus L. in northeastern Ohio

Distribution: Massachusetts southward and westward across the entire United States.

Florida Records: Foote (1965) indicates that the species is found in Florida, however, no specific location is given.

Not much is known on the biology of this species in Florida, females oviposit into buds or young shoots of swamp ragwort, Senecio aureus L., in northeastern Ohio. Larvae overwinter within the plant tissues and form small stem galls. Novak and Foote (1975) described the biology and the immature stages of this species. The specimen illustrated is from North Carolina.

Genus Strauzia Robineau-Desvoidy

Strauzia Robineau-Desvoidy, 1830. Mem. Acad. Roy. Sci.

Inst.. France 2:81. Type species: Trypeta longipennis Wiedemann.

Grossly resembling Anastrepha, but immediately differentiated by its distinctive wing markings and by head and thoracic chaetotaxy. Head yellow, higher than long with moderately swollen occiput. Eyes small, oval. Only 1 pair of upper fronto-orbitals and 3 pairs of lower fronto-orbital bristles, borne on distinct ridge in males. Thorax predominantly yellow, with yellow to brown setae on the dorsum. Dorsocentral bristles close to transverse line between supra-alars than to a line between acrostichals. Scutellum with 2 pairs of strong scutellars. Legs entirely yellow. Wing with brownish banding on a hyaline field. Vein $R_4 + 5$ setose just beyond r-m crossvein. Vein Cu_2 concave, resulting in an elongation of cell 1st A along vein $Cu_2 + 2nd\ A$. Male with somewhat narrower wing. Abdomen ochraceous yellow with numerous black hairs on dorsum.

Virtually nothing is known about the biology of the species. The genus is restricted to North America with only 1 species known. Phillips (1923) discussed the 7 known varieties.

Strauzia longipennis (Wiedemann)

Figs. 54, 105, 155

Trypeta longipennis Wiedemann, 1830, Auss. Zweifl. Inst.

2:483. Syntypes ♂ and ♀. Type locality: Nordamer, Ka.

Differentiated from other known Florida tephritid by its distinctive wing pattern (Fig. 54). Cell R always with a hyaline area in the middle. Cell 2nd M_2 with a large hyaline area. Hyaline crossband extends beyond cell 1st M_2 . Antennae short, not more than 1/2 that of face. Male with posterior lower fronto-orbital bristles enlarged, usually borne on distinct ridges. Abdomen ochraceous yellow, with dark brown setae. Ovipositor sheath long, distal tip tinged with dark brown 1.1 mm long. Piercer long and slender, widest at distal 1/2, apex abruptly tapered to a point and approximately 0.9 mm. Extended ovipositor 2.2 mm long. Male genitalia as in Fig. 105. Epandrium yellow, with long fine setae on the dorsum. Surstyli long and slender with truncate apices. Proc-tiger small elongate, with numerous long pale setae dorsally and lateroventrally.

Length: body 4.4-4.9 mm; wing 4.4-4.8 mm. (N=5).

Hosts: Unknown

Distribution: Montana to Maine, south to California and Florida.

Florida Records: Leon Co.: Tallahassee, 1♂, 6-V-1968
(G. H. Heinrich, FSCA); 1♀, 7-V-1968 (H. V. Weems, Jr., FSCA).

The variety shown is that of vittigera. Phillips (1923) presented wing figures and a key to the 7 varieties described by Loew (1873). The single species, longipennis, is uncommon in Florida. Nothing is known about its biology and immature stages.

Genus Tephritis Latreille

Tephritis Latreille, 1904. Dict. d'Hist. Nat., Deterville
24:196. Type species: Musca arnicae Linnaeus.

Differentiated by having 2 pairs of upper fronto-orbital bristles, 2 pairs of scutellars and a reticulate wing pattern. Head wider than high, all bristles strong, with 2 pairs of upper fronto-orbital bristles, the posterior pair pale and scale-like; 2 pairs of lower fronto-orbital bristles present. Thorax grayish pollinose, with whitish tomentum. Dorsocentral bristles close to transverse suture. Legs entirely yellow. Wing with a reticulate markings, with hyaline spots and dark rays reaching to the margin. Apical $1/2$ of vein $R_4 + 5$ setose.

The reticulate wing pattern of this genus is likely to be confused with that of other Florida genera, Dyseuaresta Euaresta, Euarestoides, and Trupanea because of the reticulate wing pattern. It differs from all other genera except Euaresta by having 2 pairs of lower fronto-orbital bristles and from Dyseuaresta and

Trupanea by the presence of 2 pairs of scutellars. All Euaresta species have some kind of hyaline marking on stigma. The fore femora of males are swollen, and the male genitalia have conspicuous striations around the anal region.

Not much is known about the biology of these species. Like members of Trupanea, they develop in the flower heads and ovaries of various plants. An account of the life history and mating behavior of Tephritis stigmatica (Coquillett) was presented by Tauber and Toschi (1965b). The genus is widely distributed, with 16 Nearctic species; only 1 species is known from Florida. Quinsberry (1951) and Foote (1960c) have revised the genus.

Tephritis subpura (Johnson)
Figs. 55, 106, 156

Euaresta subpura Johnson, 1909, Psyche 16:114. Holotype ♀.

Type locality: Wildwood, New Jersey (MCZ).

Readily differentiated from other Tephritis by the wing markings as shown in Fig. 55, in combination with the color of the thorax. A predominantly yellow species, with bright yellow pollinose thorax. A pair of dorsocentral bristles located at transverse suture. Costal cell without distinct brownish spot and the preapical dark brown area entire, not broken by many small confluent spots. Abdomen yellowish brown. Female ovipositor short, about 2.0 mm long. Ovipositor sheath dark brown to black, 1.0 mm long. Piercer wide and short, but sharp at apex, approximately

0.8 mm long. Male genitalia as in Fig. 106. Epandrium highly arched, with scattered setae. Surstyli broad, curved inward more or less truncate of apices. Proctiger small and elongate with numerous long setae ventrally.

Length: body 4.3-4.7 mm; wing 3.9-4.5 mm. (N=8).

Hosts: Baccharis glomeruliflora Pers.

Distribution: New York to Florida.

Florida Records: Alachua Co.: Gainesville, Bivens Arm Lake, 1♂, 27-I-1973 (J. B. Heppner, FSCA); Broward Co.: Ft. Lauderdale, 1♂, Galactia, 11-V-1950 (O. D. Link FSCA); Brevard Co.: Malabar, 9♂ 5♀, bred from stem of Baccharis glomeruliflora, 5-10-V-1931 (D. J. Nicholson, USNM); Dade Co.: Homestead, 1♂ 2♀, in McPhail trap, 4-IV-1962 (C. J. Fay, FSCA); Miami, 3♂ ex Baccharis glomeruliflora, 3-VII-1960 (D. A. Palmer, FSCA); 1♂, 10-VI-1972 (Will. Pierce, FSCA); Desoto Co.: Arcadia, 1♂, sweeping wax myrtle, 23-III-1977 (H. V. Weems, Jr., FSCA); Duval Co.: Jacksonville, 1♀, 9-I-1967 (R. E. Kling, Jr., FSCA); Hendy Co.: 1♀, in Mexican fruit fly trap, 19-III-1960 (Wilson, FSCA); Orange Co.: Orlando, 5♂ 4♀, bred from stem of Baccharis glomeruliflora, 25-30-IV-12V-1931 (D. J. Nicholson, USNM); Seminole Co.: 1♀, in Medfly trap, 12-III-1958 (R. L. Arnold, FSCA); Volusia Co.: Osteen, 2♂ 2♀, bred from stem of Baccharis glomeruliflora, 21-25-V-1931 (D. J. Nicholson, USNM).

This species can be distinguished further by the broad dark oblique band from the costa through the stigma and r-m crossvein and by having a generally dark reticulate pattern. The larvae feed in young stems of Baccharis glomeruliflora. Detailed descriptions of the immature stages was given by Benjamin (1934).

Genus Tomoplagia Coquillett

Tomoplagia Coquillett, 1910, Proc. U.S. Natl. Mus. 37:615

Type species: Trypeta obliqua Say.

Readily differentiated from other genera by its distinctive wing pattern, usually consisting of 4 coherent oblique yellow bands with narrow brown distal borders. Crossveins r-m and m oblique and closely placed, both covered by the median band of the wing pattern.

All head and body bristles yellow. Head higher than long, with 2 pairs of upper fronto-orbital bristles and 3 pairs of lower fronto-orbital bristles. Third antennal segment with rounded apex. Body yellow with conspicuous black markings on the thorax and abdomen. Mesonotum with numerous yellow setae. Dorsocentral bristles closer to transverse suture than to a line in front of anterior supra-alars. Scutellum with 2 pairs of bristles.

Of the 43 known species, only 2 species occur in North America, with obliqua (Say) being the only species known in Florida.

Aczel (1955) reviewed all the important species except for obliqua.

The larvae of many Tropical Tomoplagia feed on fleshy fruits,

other feed on other parts of the host plants.

Tomoplagia obliqua (Say)

Figs. 56, 107, 157

Trypeta obliqua Say, 1830. J. Acad. Nat. Sci. Phila.

6:186. Holotype ♀. Type locality: Indiana.

Rather yellow brown species with distinct oblique wing pattern (Fig. 56). Mesonotum marked with 2 black spots, one on each side. Venter of thorax near mid-coxae, hind coxae, and near the base of 1st abdominal segment marked with black spots one on each side. Scutellum shining translucent ochraceous yellow. Abdominal tergites marked with 2 black spots. Ovipositor sheath short and broad, light yellow; the distal tip tinged with brown about 0.9 mm long. The piercer broad and blunt, approximately 0.7 mm long, apex rounded gradually; extended ovipositor 2.3 mm long. Male genitalia small, light brown (Fig. 107). Epandrium highly arched; surstyli short and straight-sided, with blunt apices, more or less rounded. Proctiger small and elongated, dorsum covered with numerous fine setae.

Length: body 3.3-4.0 mm; wing 3.8-4.0 mm. (N=10).

Hosts: Vernonia blodgettii Small

Vernonia gigantea (Walt.) Trel.

Vernonia scaberrima Nutt.

Vernonia sp.

Distribution: Nebraska to New York, south to Arizona:
northern Mexico, Florida and Cuba.

Florida Records: Alachua Co.: Gainesville, 1♀, in McPhail trap, 13-XI-1967 (A. E. Graham, FSCA); Broward Co.: Ft. Lauderdale, 1♂, in McPhail trap, 30-XII-1959 (G. W. Spencer, FSCA); Plantation, 1♀, in Steiner trap, 16-IV-1973 (J. A. Tucoulat, FSCA); Collier Co.: 1♂, 24-XI-1969 (K. Hickman, FSCA); Dade Co.: 1♂ 1♀, 17-XI-1936 (O. D. Link, FSCA); Homestead, 4♂ 1♀, on Casimiroa edulis, 2-VII-1948 (O. D. Link, FSCA); Miami, 1♀, 1-XII-1953 (O. D. Link, FSCA); Hillsborough Co.: 6♂ 1♀, bred from Vernonia scaberrima, 11-VI-1930 (Pope & White, USNM); Tampa, 1♂, bred from Vernonia blodgettii, 10-VI-1930 (F. S. Blanton, FSCA); Thonotosassa, 19♂ 6♀, bred from Vernonia blodgettii, 8-20-VI-1930 (Pope & White, USNM); Indian River Co.: Vero Beach, 1♀, in McPhail, 28-XI-1972 (R. H. Kendrick, FSCA); Lake Co.: Fruitland Park, 3♂ 4♀, bred from Vernonia sp., 23-28-VI-1930 (E. T. Evans, USNM); Marion Co.: Bay Lake, 1♀, in Steiner trap, 9-I-1973 (J. C. Taylor, FSCA); Ocala, 2♂ 1♀, bred from Vernonia gigantea, 14-VII-1930 (E. T. Evans, & D. J. Nicholson, USNM); Orange Co.: Orlando 5♂ 6♀, bred from Vernonia scaberrima, 11-14-VI-1930 (D. J. Nicholson, USNM); 6♂, bred from Vernonia scaberrima, 17-19-VI-1930 (D. J. Nicholson, USNM); 5♂ 2♀, bred from Vernonia scaberrima 21-26-VI-1930 (D. J. Nicholson, USNM); Palm Beach Co.: Terrytown, 1♀, stickyboard trap in guava tree, 22-XI-1965 (W. W. Smith; FSCA); Santa Rosa Co.: Milton, 1♀, 26-X-1832 (F. S. Blanton, FSCA).

It is generally distributed throughout Florida. Although not abundant, this species is not rare. The immature stages of this species were described by Benjamin (1934).

Genus Toxotrypana Gerstaecker

Toxotrypana Gerstaecker, 1860, Stettin. Entomol. Ztg.

21:194. Type species: Toxotrypana curvicauda Gerstaecker.

Differentiated from other Florida genera by the characteristic shape, size, general coloration and behavior. Predominantly ochraceous yellow with black maculation on the thorax. Head broad as thorax. Chaetotaxy greatly reduced, lacking many of the major bristles of the head and thorax. One pair of upper fronto-orbital bristles and 3 pairs of lower fronto-orbital bristles present, but greatly reduced. Thorax with short yellowish brown setae on dorsum; humeral, presutural and dorso-central bristles lacking, other bristles present, but greatly reduced. Scutellum with 1 pair of short apical scutellars. Wing long and narrow, anterior $1/3$ of wing with prominent yellowing. Vein R_{2+3} undulating and sexually dimorphic. Vein R_{2+3} in male with distinct short fork on its distal $1/2$; female lacking fork. Vein R_{4+5} setose to $2/3$ of the length. Cell $1st\ M_2$ very long, almost twice that of cell R_5 , Cross-vein m oblique. Legs yellow, hind femora and coxae with brown to black markings. Abdomen yellow long and slender.

The biology of this species has been investigated (Knab & Yothers, 1914; Mason, 1922; Benjamin, 1934; Baker et al., 1944). The larvae commonly attack both wild and cultivated papayas and have also been recorded to attack mango, the only other known host. The genus contains only 1 species, the well-known papaya fruit fly in the New World.

Toxotrypana curvicauda Gerstacker
Figs. 57, 158

Toxotrypana curvicauda Gerstacker, 1860, Stettin Entomol. Ztg. 29:194. Holotype ♀. Type locality: St. John, Virgin Island.

Predominantly yellow, easily differentiated by its characteristic resemblance to several species of vespid wasps in size, form, and general coloration, as well as behavior. Thorax ochraceous yellow except for the following black mark on the hind portion of each humerus, extending ventrally, running between the front and mid-coxae and extending dorsally in a loop on anterolateral portion of mesonotum. A pair of submedial vittae extending from the anterior margin and ending just beyond the line in between supralars. Posterior notopleuron with a short vitta which extends posteriorly and ending just beyond postalars. Metanotum with 2 dark longitudinal stripes. Wing hyaline with distinct yellowing along the costa. Female with very long slender abdomen and greatly elongated ovipositor. Ovipositor sheath very narrow and long, exceeding the length of abdomen, thorax, and head. Male genitalia not dissected.

Length: body 9.5-25 mm; wing 7-11 mm. (N=10).

Hosts: Carica papaya L.

Mangifera indica L.

Distribution: Florida, southern Texas

Florida Records: Brevard Co.: Melbourne, 1♂, in Carica papaya, 10-V-1956 (J. D. Coston, FSCA); Broward Co.: 2♂ 1♀, 1962-1963, Medfly program (H. V. Weems, FSCA). Dade Co.: Cutler Ridge, 1♂ 2♀, in McPhail trap, 27-III-1962 (R. T. McMillan, Jr., FSCA); Hialeah, 1♂ 1♀, in McPhail trap in grapefruit, 20-III-1962 (W. S. Brewton, FSCA), 1♀, in McPhail trap, 26-IV-1962 (W. S. Brewton, FSCA); 1♂, in Steiner trap in roseapple, 11-V-1962 (W. S. Brewton, FSCA) 1♂ 1♀, on Carica Papaya, 11-V-1959, (L. J. Daigle, FSCA); Miami, 1♀ in McPhail trap 5-IV-1962 (J. A. Stephens, FSCA); 1♀, in McPhail trap, 11-IV-1962 (W. S. Brewton, FSCA), 2♂ 1♀ in McPhail trap, 12-IV-1962 (W. S. Brewton, FSCA), 1♂ 1♀, in McPhail trap, 19-IV-1962 (J. A. Stephens, FSCA); 1♂, in McPhail trap in grapefruit trap, 25-IV-1962 (W. W. Brewton, FSCA); 2♂ 2♀, in McPhail trap 26-IV-1962 (J. A. Stephens, FSCA); 1♂ 1♀, in McPhail trap, 17-V-1962 (J. A. Stephens, FSCA); 1♂ 1♀, in McPhail trap, 23-V-1962 (W. S. Brewton, FSCA); Miami Beach; 1♂, in McPhail trap, 8-III-1962 (W. S. Brewton, FSCA); in McPhail trap, 21-III-1962 (W. S. Brewton, FSCA); 1♂ 1♀, in McPhail trap in calamondin tree, 10-V-1962 (W. S. Brewton, FSCA); Miami Spring, 1♂, in McPhail trap, 8-III-1962 (J. A. Stephens, FSCA); South Miami, Matheson Hamm., 1♂, in McPhail trap, 16-III-1962 (R. T. McMillan, Jr., FSCA); Lee Co.: Ft. Myers, 1♂, in McPhail trap, 11-IV-1962 (H. W. Collins, FSCA); 1♂ 1♀, in

McPhail trap, 18-V-1962 (H. W. Collins, FSCA); Manatee Co.; Palmetto 1♂ 1♀, from papaya, 29-IV-1962 (C. J. Bickner, FSCA); Orange Co.: Beuna Vista, 1♂, I-1914 (C. A. Mosier, AMNH); Sarasota Co.: Sarasota, 1♂ 1♀, in McPhail trap, 2-XII-1969 (S. V. Hiatt, FSCA); St. Lucie Co.: Ft. Pierce, 1♂, in McPhail trap in mango tree, 20-IV-1962 (E. Prange, FSCA).

This species is recognized by the wing pattern and by the characters discussed for the genus. This fly is one of the most important pests of papaya wherever this fruit is grown. It was introduced into Florida about 1905 and became established on the Keys, where it eventually spread to all portions of the state where papayas are grown. The biology and the immature stages of this species were discussed in great length by Knab and Yothers (1914), Mason (1922), Benjamin (1934), Phillips (1946), and Weems (1969).

Genus Trupanea Schrank

Trupanae Guettard, 1862, Acad. Roy. Sci. Hist. Mem. Math. Phys. 1756:171. Unavailable name, author not using binomial.

Trupanea Shrank, 1795, Natur. Hist. und. Okon. Briefe Donaumoos Mannheim, p. 147. Type species: radiata Shrank.

Predominantly gray pollinose, easily differentiated by wing marking, a distinct stellate pattern, usually restricted to the apex of the wing (Fig. 58, 59, 60, 61, 62) and by having only 2 scutellar bristles. Head usually yellowish gray, with 2 pairs of upper fronto-orbital bristles and 3 pairs of lower fronto-orbital

bristles. Thorax and scutellum gray pollinose, with 1 pair of dorsocentral bristles situated near the transverse suture.

Abdomen densely gray pollinose. Ovipositor and male genitalia shining brown or black.

Larvae infest flower heads, principally of Compositae.

The genus occurs world-wide; 5 of the 20 North American species are recorded from Florida. Because wing characteristics are so easily seen and almost universally present, the key to North American species of Trupanea published by early workers, Adams (1904), Phillips (1923), Curran (1932b), and Malloch (1942) almost excluded other characters in their identification. Foote (1960d), in his revision of the genus, provided keys to male and female to avoid difficulties with sexual dimorphism.

Key to the Florida Species of Trupanea

1. Two dark rays through cell 1st M_2 ; proximal ray sometimes broken in posterior 1/2 of cell and not attaining vein $M_3 + Cu_1$ or broken in center of cell. 2
- 1'. One dark ray through cell 1st M_2 ; in addition, sometimes a spot near the middle of that cell and a dark spot in line with it on vein $M_3 + Cu_1$ 4
2. Distal ray through cell 1st M_2 continuing to hind margin of wing proximal ray ending at middle of cell 1st M_2 (Fig. 60).
 dacetroptera Phillips

- 2'. Distal ray through cell 1st M_2 only to vein $M_3 + Cu_1$ and never beyond; proximal ray reaching vein $M_3 + Cu_1$ or sometimes broken a dark spot may be present near the middle of cell 1st M_2 3
3. Hyaline area immediately distad of stigma rather pointed posteriorly (Fig. 62). mevarna (Walker)
- 3'. Hyaline area immediately distad of stigma distinctly rounded posteriorly or ending broadly on vein $R_4 + 5$ (Fig. 59).
. ageratae Benjamin
4. Apex of cell R completely hyaline except for an occasional narrow band of infuscation along vein $r-m$ 5
- 4'. Apex of cell R distinctly infuscated in addition to narrow band along vein $r-m$ 6
5. Dark ray from stigma to vein $r-m$ broken or absent in cell R_3 (Fig. 61). eclipta Benjamin
- 5'. Dark ray from stigma to vein $r-m$ complete in cell R_1 and R_3 (Fig. 58). actinobola (Loew)
6. Hyaline area immediately distal of stigma more or less acute apically, infuscation on vein $M_3 + Cu_1$ in the form of spot entirely lacking (Fig. 62). mevarna (Walker)
- 6'. Hyaline area immediately distal of stigma rounded broadly posteriorly; infuscation in the form of spot on $M_3 + Cu_1$ (Fig. 58)
. actinobola (Loew)

Trupanea actinobola (Loew)

Figs. 58, 108, 159

Trypeta actinobola Loew, 1873, Smiths. Misc. Collect.,

11(256). Holotype ♂. Type locality: Belfrage, Texas.

Fitting the general characteristics of this genus, readily differentiated from other Trupanea by having the head about as long as high with a flat profile in both sexes. Wing with a single ray through cell 1st M_2 (Fig. 58) commonly ending short of vein $M_3 + Cu_1$: hyaline area immediately distad of stigma rounded posteriorly: a spot near the middle of cell 1st M_2 and a dark spot on vein $M_3 + Cu_1$ may be present: this is variable: some species do not have this character. Female ovipositor very similar to that of eclipta, moderately long about 2.1 mm: the ovipositor sheath black, about 0.8 mm long. The piercer 0.7 mm long, apex pointed and minutely bilobed. Male genitalia as in Fig. 108. epandrium highly arched with scattered setae. Surstyli short, blunt at apex. Proctiger small, with scattered setae lateroventrally.

Length: body 2.5-2.8 mm; wing 2.5-2.8 mm. (N=9).

Hosts: Aster adnatus Nutt.Aster carolinianus Walt.Aster dumosus L.Aster dumosus L. var. subulaefolius T & GAster elliottii T & GBalduina angustifolia (Pursh) RobinsonCoreopsis sp.

Erigeron quercifolius Lam

Erigeron vernus (L.) Torr. & A. Gray

Erigeron sp.

Happloppapus divaricatus (Nutt) Gray

Heterotheca sp.

Hieracium sp.

Solidago caesia L.

Solidago chapmanii T & G

Solidago gigantea Ait.

Solidago stricta Ait.

Solidago Sp.

Distribution: Idaho to Massachusetts, south to California,
Florida

Florida Records: Alachua Co.: 2♂, 1♀, 12-VII-1954 (H. A. Denmark, FSCA); 3♂2♀, 25-IV-1955 (H. A. Denmark, FSCA); Gainesville, 6♂ 3♀, reared ex Erigeron quercifolius 20-V-1979 (I. B. Rohani, FSCA); 16♂ 5♀, reared ex Aster dumosus, 1-12- XI-1978 (I. B. Rohani, FSCA); 6♂ 3♀, reared ex Aster elliottii, 27-XI-1978 (I. B. Rohani, FSCA); Brevard Co.: Merritt Island, 4♂ 1♀, 12-II-1956 (H. V. Weems, Jr., FSCA); Clay Co.: Orange Park; 3♂ 2♀, 25-III-1952 (J. R. Vockeroth, CNC); Dade Co.: Coral Gables, 11♂ 5♀, bred from Solidago serotina, 12-19-V-1930 (D. J. Nicholson, USNM); Hialeah, 1♂ 2♀, 29-IX-1965 (C. E. Stegmaier, Jr., FSCA); 1♂, swept unidentified compoiste, 21-VII-1965 (C. E. Stegmaier, Jr., FSCA) Homestead, 3♂ 3♀, Erigeron quercifolius, 15-V-1930 (D. J. Nicholson, USNM); Opalocka, 19♂ 12♀, bred from Erigeron vernus, 15-V-1930 (D. J. Nicholson, USNM) 16♂ 1♀, bred from Erigeron sp., 12-V-1930 (D. J. Nicholson, USNM); South Miami, 3♂ 3♀, Erigeron quercifolius, 15-V-1930 (D. J. Nicholson,

USNM); Miami Beach, 9♂ 10♀, Erigeron vernus, 15-V-1950 (D. J. Nicholson, U.S.M); Escambia, Co.: Pensacola 2♀, 11-14-X-1941 (AMNH); Lake Co.: 2♂ 4♀, 8-IV-1956 (R. A. Morse, FSCA); Leesburg, 6♂ 4♀, reared ex Erigeron quercifolius, 10-14-1979 (J. Gilmore, & I. B. Rohani, FSCA); Levy Co.: 6♂ 3♀, sweeping weeds, 13-IV-1955 (R. A. Morse, FSCA); Gulf Hammock, 2♀ 23-IV-1952 (O. Peck, (NC); 4♂ 1♀, 23-IV-1952 (J. R. Vockeroth, CNC); Manatee Co.: Bradenton, 3♂ 3♀, swept Erigeron quercifolius, 17-IV-1979 (I. B. Rohani, FSCA); 3♂, reared ex Erigeron quercifolius, 17-IV-6-V-1979 (I. B. Rohani, FSCA); Onea, 1♂, 29-III-1956 (John C. Mattin, CNC); Marion Co.: Silver Spring, 1♂, 5-IV-1953 (W. R. M. Mason, CNC); Martin Co.: Indiantown, 1♂ 2♀, Solidago chapmani, 7-VI-1930 (Beaver, USNM) Nassau Co.: Callahan, 3♂ 1♀, reared ex Haploppapus divaricatus, 16-18-IV-1979 (I. B. Rohani & R. A. Belmont, FSCA) 40♂ 30♀, reared from Erigeron quercifolius, 16-27-IV-1979 (R. A. Belmont & I. B. Rohani, FSCA); 24♂ 26♀, reared ex Erigeron quercifolius, 19-IV-1979 (R. A. Belmont & I. B. Rohani, FSCA); Orange Co.: Orlando, 2♂, 24-X-1931 (FSCA); 8♂ 2♀, bred from Solidago sp. 9-16-XI-1929, bred from solidago sp. (D. J. Nicholson, USNM); 20♂, emerged from Aster adnatus, 13-XI-1929 (D. J. Nicholson, USNM); Winter Garden, 2♂, bred from Aster carolinianus, 9-XII-1930 (D. J. Nicholson, USNM); Pasco Co.: 1♂, 6-IV-1952 (J. R. Vockeroth, CNC); Volusia Co.: 2♂, 24-VII-1954 (H. V. Weems, Jr., FSCA); Benson Spring, 6♂, bred from Erigeron vernus, 24-VI-1930 (Pope & White, USNM).

This widespread and common species breeds in flower heads of Compositae throughout Florida. It is extremely variable; most individuals exhibit differences in the development of the single ray through cell 1st M_2 with apex of cell R with or without infuscation. The variation of this species could be related to the breeding habit of the species, but this deserves, additional study. Stegmaier (1968b) studied the biology of this species and reported that the immature stages infest the unopen and fully developed flower head of daisy fleabane Erigeron strigosus. Two hymenopterous parasites, Heteroschema punctata (Ashmead) and Colotrechnus ignotus Busks were reared from these immatures. The puparium is similar to that of mevarna (Benjamin, 1934).

Trupanea ageratae Benjamin
Figs. 59, 160

Trupanea ageratae Benjamin, 1934. U.S. Dept. Agric. Tech. Bull. 401:56, Fig. 40, Holotype ♂. Type locality: No Name Key, Monroe Co., Florida (USNM).

A small grayish pollinose species with 2 dark rays through cell 1st M_2 of wing; the distal ray through cell 1st M_2 only to vein $M_3 + Cu_1$; hyaline area immediately distal of stigma rounded posteriorly. Marginal spot at apex of vein $R_2 + 3$ near middle of dark area surrounding it. Female ovipositor and male genitalia are not available for dissection.

Length: body 2.6 mm; wing 2.5 mm. (Benjamin, 1934).

Hosts: Ageratum littorale Gray.

Distribution: Restricted to Florida only.

Florida Records: Monroe Co.: No Name Key, (Holotype) 1♂, bred from Ageratum littorale, 23-XI-1930 (D. J. Nicholson, USNM).

This species is similar to dacetroptera in having the distal end of cell R highly infuscated, but differs by having the distal ray through cell 1st M_2 only to vein $M_3 + Cu_1$ and never reaching the hind margin. Similar to mevarna in having the distal ray only to vein $M_3 + Cu_1$ differs from it by having the hyaline area immediately distal of stigma distinctly rounded posteriorly or ending broadly on vein R_{4+5} . This species also closely resembles texana Malloch; the 2 species may be separated by their geographical distribution and by having the marginal spot at apex of vein R_{2+3} near middle of dark area surrounding it. Detailed discussion on the differences was given by Foote (1960d).

Trupanea dacetroptera Phillips

Figs. 60, 109, 161

Trupanea dacetroptera. Phillips, 1923, J. N.Y. Entomol. Soc. 31:138. Fig. 59. Holotype ♀. Type locality: Karner, N.Y. CCO.

Differentiated from other known Trupanea by the distinctive wing markings (Fig. 60); distal ray extending through cell 1st M_2 to hind margin; proximal ray from the stigma to vein r-m complete or nearly so; distal area near to vein r-m in cell R broadly infuscated.

Head shape and chaetotaxy typical of the genus: yellowish brown with pollinose gray; anterior oral margin not markedly produced; 2 pairs of upper fronto-orbitals, 3 pairs of lower fronto-orbitals the anterior pair being weaker. Mesonotum gray pollinose with one pair of dorsocentrals closer to the transverse suture. Abdomen opaque; ovipositor sheath shining black, approximately equal in length to the piercer, being 1.0 mm long respectively, apex of the piercer, long, gradually tapered into a sharp point. Extended ovipositor 3.0 mm. Male genitalia small; epandrium highly arched; surstyli relatively short curved inward, apex blunt, more of less truncate; proctiger small with scattered long setae (Fig. 109).

Length: body 3.3-4.2 mm; wing 3-3.5 mm. (N=4).

Hosts: Graphalium obtusifolium L.

Heterotheca nervosa (Willd.) Schinner var. microcephala
(Small) Shinnors

Distribution: N.Y.; Michigan; Maine to Florida.

Florida Records: Gadsden Co.: Chattahoochee, 1♀, 30-IV-1952 (O. Peck, CNC); Orange Co.: Orlando, 6♂ 11♀, bred from Gnaphalium obtusifolium, 4-13-X-1930 (D. J. Nicholson, USNM), 1♂ 1♀, bred from Gnaphalium obtusifolium, 29-IX-1930 (D. J. Nicholson, USNM), 2♂ 3♀, bred from Gnaphalium obtusifolium, 12-XI-1930 (D. J. Nicholson, USNM); 1♂ 1♀, bred from Heterotheca nervosa var. microcephala, 1-X-1930 (D. J. Nicholson, USNM).

This species is less common than some other species in the genus, being found only in some Florida counties. Virtually

nothing is known about their immature stages; larvae are scarce.
and difficult to find.

Trupanea eclipta Benjamin
Figs. 61, 110, 162

Trupanea eclipta Benjamin, 1934, USDA Tech. Bull. 401:57,
Fig. 42. Holotype ♂. Type locality, Orlando, Orange Co., Florida.

Differing from other known species of Trupanea by the wing markings (Fig. 61); having dark ray from stigma to vein r-m broken or absent in cell R₃, usually no spot on vein M₃+Cu₁; distal end of cell R completely hyaline; but occasionally a narrow band of infuscation bordering vein r-m may occur. Chaetotaxy on thorax typical of this genus with dorsocentral bristles located near the suture; 1 pair of strong scutellars. Basal segment of female ovipositor dark brown to black. About 0.9 mm long, extended ovipositor measures 2.5 mm. Piercer straight-sided, 0.8 mm long, tapered at apex. Male genitalia brown, small and compact; epandrium highly arched, with scattered long setae; surstyli curved inward, its apex blunt; proctiger small (Fig. 110).

Length body, 2.8-3.6 mm; wing 3.0-3.2 mm. (N=4).

Hosts: Eclipta alba (L.) Hassk.

Distribution: Florida.

Florida Records: Duval Co.: Jacksonville 2♂ 1♀, 14-X-1932 (F. S. Blanton, FSCA); 1♀, 11-XI-1965 (C. F. Zieger, FSCA); Monroe Co.: Boca Chica Key, 1♀, 16-I-1972 (W. H. Pierce, FSCA); Paradise Key, Everglades Nat'l Pk., 1♀, 3-IV-1952 (G. S. Walley, CNC); Orange Co.:

Orlando, 79♂ 49♀, bred from Eclipta alba, 14-26-VIII-1930 (D. J. Nicholson, USNM); 2♂ 1♀, bred from Eclipta alba, 2-X-1930 (D. J. Nicholson, USNM); 19♂ 11♀, bred from Eclipta alba, 9-30-IX-1930 (D. J. Nicholson, USNM); St. Lucie Co.: Ft. Pierce, 3♂, in lima bean, 29-XII-1943 (USNM); Volusia Co.; Ormond Beach, 3♀, 3-XI-1960 (R. E. Woodruff, FSCA).

This species is known only from Florida. It has been found in only a few counties. Larvae feed in the flowers of Eclipta alba, and the puparium is similar to that of mevarna (Benjamin, 1934).

Trupanea mevarna (Walker)
Figs. 62, 111, 163

Trypeta mevarna Walker, 1849, List. Dipt. Brit. Mus. 4:102.
Holotype ♀. Type locality: Florida.

Differentiated from other known Trupanea by the termination of the distal ray through cell 1st M_2 at vein $M_3 + Cu_1$, by the acutely pointed hyaline area distal of the stigma, and by having a prominent marginal spot at the apex of vein R_{2+3} in the surrounding dark area at a more central position. Body predominantly gray pollinose, with similar chaetotaxy as other members of the genus. Female ovipositor long, about 2.9 mm, the ovipositor sheath black, 1.0 mm long; sharp point. Male genitalia brown as in Fig. 111. Epandrium highly arched with numerous setae. Surstyli curved inward, apex more or less truncate. Proctiger small with many scattered setae.

Length: body 3.5-4.0 mm; wing 3.4-3.9 mm. (N=4).

Hosts: Chrysopsis graminifolia (Michx.) Ell.

Heterotheca nervosa (Willd.) Shinnars var. microcephala
(Small) Skinners

Heterotheca oligantha (Chapm.) Harms.

Heterotheca sp.

Distribution: Rhode Island to Kansas; Alabama and Florida

Florida Records: Alachua Co.: Gainesville, 1♀, sweeping weed, 26-VIII-1955 (R. A. Morse, FSCA); 1♂, open vacant myrcinite-grass, 30-V-1967 (F. W. Mead, FSCA); Brevard Co.: Malabar, 3♂, bred from tender top of Heterotheca sp., 11-12-V-1930 (D. J. Nicholson, USNM); 1♀, bred from tender tip of Heterotheca sp., 22-25-V-1930 (D. J. Nicholson, USNM); Duval Co.: Jacksonville, 1♂, 3-XI-1911 (AMNH); 2♂ 2♀, 14-20-VIII-1932 (F. S. Blanton, FSCA); Holmes Co: Ponce De Leon, 1♀, reared from Heterotheca oligantha, 29-V-1930 (D. J. Nicholson, USNM); Bonifay, 1♂ 2♀, bred from Heterotheca oligantha, 2-V-1930 (D. J. Nicholson, USNM); Lake Co.: Tavares, 2♀, bred from Heterotheca sp., 10-15-VII-1930 (D. J. Nicholson, USNM); Marion Co.: Ocala, 1♂, 5-XI-1932 (F. S. Blanton, FSCA); Martin Co.: 1♂, 5-XI-1954 (H. V. Weems, Jr., FSCA); Nassau Co.: 3♀, reared from Heterotheca oligantha, 16-18-IV-1979 (R. A. Belmont & I. B. Rohani, FSCA); Orange Co.: Orlando, 3♂ 12♀, bred from Chrysopsis graminifolia, 10-28-X-1930 (D. J. Nicholson, USNM). Santa Rosa Co.: Milton, 1♂ 3♀, 20-VIII-1932 (F. S. Blanton, FSCA); Volusia Co.: Benson Spg., 1♂ 1♀, bred from Heterotheca nervosa var. microcephala, 24-VI-1932 (Pope & White, USNM).

This species is probably widespread throughout Florida. The wing pattern of this species is extremely variable; this includes the infuscation in the apex of cell R; proximal dark ray in cell 1st M_2 may be lacking in some species and in others may be represented by a spot on vein $M_3 + Cu_1$, Trupanea nevana closely resembles dacetoptera, but can easily be differentiated from the latter by the characters given in the keys and discussion. Larvae white, feed on flower heads of several species of Heterotheca. Benjamin (1934) briefly described the immature stages of this species.

Genus Xanthaciura Hendel

Xanthaciura Hendel, 1941, Wiener. Entomol. Ztg. 33:86.

Type species: Trypeta chrysura Thomson.

Members with predominantly dark brown to black body and characteristic dark wing markings. Vertex of head narrower than width of the eyes; head typically with 2 pairs of upper fronto-orbitals and 3 pairs of lower fronto-orbitals. Parafrontals with a row of white scale-like bristles. Thorax almost always entirely brown to black, sometimes tinged with yellow. Dorsocentral bristles in front of supra-alar bristles, almost in line with suture. Acrostichal bristles farther forward than usual for the family. Scutellum with 1-2 pairs of long bristles. Wing dark brown with the base of the anal margin hyaline, and with 2 hyaline wedges in the middle of costa. Cell 2nd M_2 with hyaline wedges. Legs entirely

yellow usually without exceptional armature except in chrysura (Thomson) and insecta (Loew). Abdomen entirely yellow or tinged with brown on the dorsum of the last 1 or 2 abdominal segments.

As far as is known, the larvae of all species inhabit the flower heads of composites. Of the 14 species in the genus, only 4 are North American with all 4 species reported from Florida. The latest revision is by Aczel (1949).

Key to the Florida Species of *Xanthaciura*

1. Wing with 2 hyaline spots in between vein R_{4+5} and M_{1+2} ; cell R without a hyaline spot; the wedge shaped areas on costa extending just beyond vein R_{2+3} to only 1/3 into cell R_3 (Fig. 64). connexionis Benjamin
- 1'. Wing with 3 hyaline spots in between vein R_{4+5} and M_{1+2} ; cell R with a hyaline spot; the wedge shaped areas on costa extending to beyond vein R_{2+3} into about 2/3 of cell R_3 2
2. Scutellum with 1 pair of scutellars; the 2 dark rays extending from the dark marking in cell 1st M_2 across cell Cu_1 to the anal margin (Fig. 63, 65). 3
- 2'. Scutellum with 2 pairs of scutellars; the dark rays extending only to the middle of cell Cu_1 (Fig. 66).
 tetraspina (Phillips)

3. Thorax bicolored, black dorsally and yellow-brown ventrally;
 vein R_{2+3} slightly wavy, with a bend on its apical $1/2$;
 cell 1st M_2 with 1 hyaline area (Fig. 65).
insecta Loew
- 3'. Thorax entirely black; vein R_{2+3} normal; cell 1st M_2 with
 2 hyaline areas (Fig. 63). Chrysura (Thomson)

Xanthaciura chrysura (Thomson)
 Figs. 63, 112, 164

Trypeta chrysura Thomson, Dipt. Fregat. Eugenies Resa,

580. Type unknown. Type locality: Rio de Janeiro, Brazil,

Small to moderately small species, easily differentiated from other Florida Xanthaciura with 2-bristled scutellum by having an entirely black thorax and by having 2 hyaline areas in cell 1st M_2 . Also by having the proximal dark ray arising from the dark field in cell 1st M_2 through cell 2nd A. The apical $1/3$ of middle and hind femorae with a narrow brown or blackish band posteriorly. Abdominal tergites II-V black, ovipositor sheath translucently yellow with a wide black band at apex, about 0.6 mm long. The piercer short, pointed at apex, 0.6 mm long. Extended ovipositor 2.1 mm. Male genitalia small (Fig. 112). Epandrium dark brown with scattered setae. Surstyli short, slightly curved inward, truncate at apices. Proctiger small with scattered setae lateroventrally.

Length: body 2.5 mm; wing 2.2-3.4 mm. (N=3).

Hosts: Unknown

Distribution: Costa Rica, Peru, Florida, Brazil.

Florida Record: Dade Co.: Everglades, 1♂, 17-VI-1979

(A. Friedberg, FSCA).

Xanthaciura chrysura and tetrapina (Phillips) are the only Florida species that have black thorax. The 2 species are further distinguished by characters given in the key. Like insecta (Loew), it has 3 dark rays through cell Cu_1 . It is differentiated from the former by having 2 hyaline areas in cell 1st M_2 and by having the base of the proximal ray in cell Cu_1 broad, and extending beyond cell Cu_1 ending in the middle cell 2nd A.

This species is relatively uncommon in collections and rarely encountered in Florida possibly because its distribution is primarily tropical. The specimens illustrated are from Peru.

Xanthaciura connexionis Benjamin
Figs. 64, 113, 165

Xanthaciura connexionis Benjamin, 1934, U.S. Dept. Agric.
Tech. Bull. 401:45, Fig. 32. Holotype ♂. Type locality:
Florida City, Florida.

A rather small species, similar to insecta (Loew) in having 1 pair of scutellars. It differs from insecta by being smaller in size averaging 2.4 mm and by the rufous yellow abdomen, with black markings on tergites IV and V in the male and tergites III-V of the female. Also by the wing pattern, cell R without a hyaline spot; the wedge-shaped hyaline areas on the costa extending just beyond vein R_{2+3} ; the 2 brown rays arising from the dark field

in cell 1st M_2 extends only to the middle of cell Cu_1 ; vein R_{2+3} unusually short and strongly waved with 2 noticeable bends. Female ovipositor 2.1 mm long. Ovipositor sheath yellow with black marking distally measuring about 0.8 mm. Piercer sharp-pointed 0.7 mm long, the distal 1/2 slightly bulged. Male genitalia yellow, tinged with brown (Fig. 113). Epandrium narrow, covered with numerous long setae dorsally, short setae laterally. Surstyli curved inward at apices; apex more or less truncate. Proctiger elongate, with long fine setae lateroventrally.

Length: body 2.0-2.8 mm; wing 2.2-2.6 mm. (N=8).

Hosts: Ageratum littorale Gray

Eupatorium coelestinum L.

Mikania scandens (L.) Willd.

Distribution: Known only in Florida

Florida Records: Brevard Co.: Merritt Island, 1♂ 1♀, bred from Eupatorium coelestinum, 5-15-X-1930 (D. J. Nicholson, USNM); Wilson, 2♀, Eupatorium coelestinum, 8-16-X-1930 (D. J. Nicholson, USNM); Broward Co.: 1♂ 1♀, bred from Eupatorium coelestinum, 5-V-1930 (D. J. Nicholson, USNM); Dade Co.: Florida City, 6♂ 3♀, bred from Eupatorium coelestinum, 1-7-V-1931 (C. F. Benjamin, USNM); Hialeah, 1♂, ex Eupatorium coelestinum, 8-IX-1970 (C. E. Stegmaier, USNM); Homestead, 4♂ 2♀, bred from Eupatorium coelestinum, 15-16-V-1939 (D. J. Nicholson, USNM); Miami 1♀, ex Mikania scandens, 21-XII-1948 (O.D. Link, FSCA); Opalocka, 5♂ 3♀, Eupatorium coelestinum, 15-17-V-1930 (D. J. Nicholson, USNM); Leon Co.: Tallahassee, 1♂, 1-XI-1949

(UGA); Monroe Co.: Lower Matecumbe Key, 4♂ 2♀, bred from Ageratum littorale, 11-18-XI-1930 (D. J. Nicholson, USNM); Upper Matecumbe Key, 1♂ 2♀, 30-III-1978 (C. L. Smith, UGA).

Xanthaciura connexionis is the only Florida member of the genus in which only 2 hyaline spots are present in between veins R_{4+5} and M_{1+2} and cell R is without a hyaline spot. The apical portion of vein R_{2+3} is oblique to the costa. Apparently this species is intermediate between insecta (Loew) and tetraspina as it has 1 pair of scutellar setae like that of the former and male genitalia and immature stages like those of the latter. Benjamin (1934) briefly described the immature stages of this species.

Xanthaciura insecta Loew
Figs. 65, 114, 166

Trypeta insecta Loew, 1862, Smiths. Misc. Collect. 6(1):72. pl. II, Fig. 8. Holotype ♀. Type locality: Cuba.

Differing from other Florida Xanthaciura by having 3 dark rays in cell Cu_1 ; the proximal ray only to the middle of vein $Cu_2 + 2nd\ A.$ and the 2 distal rays reaching the anal margin of the wing. Vein R_1 slightly waved. Cell 1st M_2 with only 1 hyaline area. Thorax black dorsally and yellow ventrally. Abdomen yellow, with black markings covering most of tergites IV-V. Ovipositor sheath yellow tinged with black markings at its apex, measuring 0.8 mm long. The piercer short and broad distally, measuring about 0.7 mm, gradually tapers to a sharp point, margin minutely serrated.

Extended ovipositor: 2.2 mm long. Male genitalia as in Fig. 114.
 Epandrium highly arched, with numerous long setae dorsally.
 Surstyli modified into 2 lobes, greatly curved lobes at lower
 apices and short densely setose lobes at upper apices. Proctiger
 small and elongate, with long pale setae laterventrally.

Length: body 2.9-4.0 mm; wing 3.0-3.2 mm (N=20).

Hosts: Ageratum sp.

Bidens bipinnata L.

Bidens coronata (L.) Britt.

Bidens laevis (L.) BSP

Bidens mitis (Michx.) Sherff

Bidens pilosa L.

Bidens pilosa var. radiata Schutz-Bip.

Borrchia frutescens (L.) DC

Heterotheca subaxillaries (Lam) Britt. & Rusby.

Distribution: Texas to North Carolina, south to Florida
 north Mexico, West Indies, Bahama Islands.

Florida Records: Alachua Co.: 2♂, 30-XI-1951 (DOK, FSCA),
 2♂ 2♀, 16-XI-1953 (H. V. Weems, Jr., FSCA); Gainesville, 1♀ ex Bidens
pilosa, 11-XI-1956 (R. A. Morse, FSCA); 2♂ 4♀, insect flight trap,
 21-X-1971 (H. V. Weems, Jr., FSCA); 3♂ 1♀, insect flight trap.
 29-X-1971 (H. V. Weems, Jr., FSCA); 10♂ 4♀ insect flight trap,
 7-18-X-1971 (H. V. Weems, Jr., FSCA); 7♂ 4♀, insect flight trap,
 1-5-XI-1971 (H. V. Weems, Jr., FSCA); 3♂ 3♀, insect flight trap
 7-10-XII-1971 (H. V. Weems, Jr., FSCA); 1♂ 1♀, black light trap

2-X-1972 (F. W. Mead, FSCA); 2♂, insect flight trap, 19-21-V-1973
 (H. W. Weems, Jr., FSCA); 6♂ 2♀, ex Biden pilosa, 31-VII-1978
 (I. B. Rohani, FSCA); 10♂ 12♀, reared from Bidens pilosa, 9-31-VII-1978
 (I. B. Rohani, FSCA); 12♂ 6♀, reared from Bidens pilosa, 10-VII-1978
 (I. B. Rohani, FSCA); 23♂ 6♀, reared from Biden pilosa 29-VII-1978
 (I. B. Rohani, FSCA); Brevard Co.: Bonaventura, 3♂ 2♀, bred from
Bidens pilosa, 25-V-1930 (Benjamin, USNM); Cocoa, 8♂ 10♀, Bidens
pilosa 17-VI-1930 (A. B. Beavers, USNM); Melbourne, 4♂ 2♀, bred from
Bidens pilosa, 19-VI-1930 (A. B. Beavers, USNM) Merritt Island, 1♀,
 29-XII-1963 (F. W. Mead, FSCA); Titusville, 2♂ 1♀, 8-VI-1931 (FSCA);
 Citrus Co.: Inverness, 3♂ 3+, bred from Bidens pilosa 28-X;
 3-XI-1930 (D. J. Nicholson, USNM); Collier Co.: Ochpee, 1♂ 1♀,
 10-VI-1973 (H. V. Weems, Jr., FSCA) Dade Co.: 1♂ 1♀, insect flight
 trap, 3-XI-1936 (O. D. Link, FSCA); Everglades Nat'l Pk., 2♂ 3♀,
 26-XII-1952 (H. V. Weems, Jr., FSCA); Hialeah, 3♂ 1♀, swept
Heterotheca subaxillaries, 21-VII-1965 (FSCA), 1♂, ex flower head
Bidens pilosa, 24-I-1971 (C. Stegmaier, Jr., USNM); Homestead 1♀,
 25-X-1948 (O. D. Link, FSCA); 2♂, 30-X-1948 (O. D. Link, FSCA); 1♀
Casimiroa edulis, 2-XII-1948 (O. D. Link, FSCA); 1♂ 2♀, sweeping
 weeds, 6-VII-1955 (R. A. Morse, FSCA); Matheson Hamm, 9♂, 8-11-
 1955, (F. W. Mead, FSCA); 2♂, at Bidens pilosa, 31-III-1966 (H. V.
 Weems, Jr., FSCA); Miami, 2♀, 5-XI-1911 (MCZ); 1♂, 15-II-1923
 (C. H. Curran, AMNH); 3♂, reared from Bidens bipinnata, 7-X-1948
 (O. D. Link, FSCA); 1♀, 3-XI-1954 (O. D. Link, FSCA); Miami Spring,
 1♀, 17-IX-1948 (O. D. Link, FSCA); Ross & Costello Hamm; 1♂ 1♀,

7-IV-1959 (H. V. Weems, Jr., FSCA); 2♂, 30-III-1963 (H. V. Weems, Jr., FSCA); 1♂, 6-VI-1963 (H. V. Weems, Jr., FSCA); Duval Co.: Jacksonville, 1♀, in insect flight trap, 26-XI-1958 (L. W. Taylor, FSCA); Hardee Co.: Wauchula, 5♀, insect flight trap in grapefruit tree, 6-X-1968 (R. H. Rhodes, FSCA); Hendry Co.: 2♂, sweeping weeds, 7-III-1955, (R. A. Morse, FSCA); Clewiston, 2♂ at Bidens pilosa, 18-X-1954 (H. A. Denmark, FSCA); Highlands, Co.: Archbold Biol. Station, 5♂ 5♀, insect flight trap, 17-19-III-1975 (H. V. Weems, Jr., FSCA); 1♂, insect flight trap, 5-VI-1978 (H. V. Weems, Jr., FSCA), 1♂, 11-XIII-1953 (H. V. Weems, Jr., FSCA); Hillsborough Co.: Tampa, 6♂ 4♀, Bidens pilosa 21-IV-1930 (D. J. Nicholson, USNM); Indian River Co.: Vero Beach, 1♂ 1♀, in wet fruit fly trap, 6-III-1959 (R. H. Kendrick, FSCA); Jackson Co.: Cavern St. Pk., 1♀ 23-IV-1961 (W. V. Weems, Jr., FSCA); Lake Co.: Leesburg, 3♂ 3♀, 1-11-III-1954 (M. Stathom, AMNH); Mt. Dora, 1♂ 3♀, bred from Bidens pilosa, 14-VII-1930 (E. T. Evans & D. J. Nicholson, USNM); Tavares, 1♂ 2♀ bred from Bidens pilosa, 19-VI-1930 (E. T. Evans, USNM); Leon Co.: Tallahassee 1-XI-1949 (W. C., UGA); Levy Co.: 1♂ 4♀, 13-III-1954 (H. V. Weems, Jr., FSCA); Manatee Co.: Bradenton, 1♂ 1♀, on flowers of Solidago stricta, 9-XII-1970 (H. R. Dodge, FSCA); Martin Co.: Indiantown, 2♂ 2♀, Bidens pilosa, 17-VI-1930 (Beavers, AMNH); Monroe, Co.: Everglades Nat'l Pk., 1♂, taken in dense wood, 20-X-1954 (H. A. Denmark, FSCA); 1♀, 8-III-1955 (H. A. Denmark, FSCA); 1♂, Borrchia frutescens, 12-III-1955 (H. A. Denmark, FSCA); 3♂, at Bidens pilosa, 7-IV-1966 (H. V. Weems, Jr., FSCA); 1♀, 25-XI-1977 (C. L. Smith, UGA); 1♂, 28-29-III-1978

(C. L. Smith, UGA) Big Pine Key, 1♀, on foliage of Schinus sp.
 15-II-1971 (W. H. Pierce, FSCA), 2♂ 1♀, sweeping weeds, 22-III-1971
 (W. H. Pierce, FSCA); 1♀, sweeping roadside weeds, 13-IV-1971)
 (W. H. Pierce, FSCA); Boca Chica Key, 1♂ 1♀, sweeping weeds,
 11-VII-1971 (W. H. Pierce, FSCA); Key Largo; 1♂, 6-XI-1911 (MCZ);
 2♀, 30-III-1978 (C. L. Smith, UGA); 1♂ 1♀, 16-XI-1911 (AMNH); 1♂ 2♀,
 under bark of dead tree, 2-IV-1966 (H. V. Weems, Jr., FSCA); 1♀, taken
 at light 19-X-1954 (H. V. Weems, Jr., FSCA); 11♂ 1♀, 26-XII-1954
 (H. V. Weems, Jr., FSCA); 6♂, 9-IV-1955 (F. W. Mead, FSCA) 1♂,
 11-IV-1959 (H. V. Weems, Jr., FSCA); Key West, 2♂, sweeping weed
 X-1970 (W. H. Pierce, FSCA); 7♂ 5♀, Bidens pilosa, 18-24-III-1930
 (Milner, USNM); Long Key, at light, 1-V-1955 (H. A. Denmark, FSCA);
 Plantaton Key, 1♂, at light, 27-XI-1955 (H. V. Weems, Jr., FSCA);
 1♂, in black light trap, 17-VII-1963 (H. A. Denmark, FSCA); Saddlebunch
 Keys, 4♂ 1♀, on Flaveria linearis, 29-XII-1953 (H. V. Weems, Jr.,
 FSCA); Stock Island, 1♀, 3-X-1971 (W. H. Pierce, FSCA); 8♂ 11♀,
 black light trap XI-1971 (W. H. Pierce, FSCA) 2♀, 9-XI-1971
 (W. H. Pierce, FSCA); 1♂, 9-I-1972 (W. H. Pierce, FSCA); Torch Key,
 2♂, 26-III-1935 (R. W. Lindner, FSCA) Orange Co.: Apopka, 3♂ 2♀,
 bred from Bidens pilosa, 21-VI-1929 (E. T. Evans, USNM); 18♂ 13♀,
 merged from Bidens pilosa, 9-28-IX-1929 (D. J. Nicholson, USNM),
 6♂ 5♀, ex Bidens pilosa, 24-30-IX-1929 (USNM) 3♂ 6♀, ex Bidens
pilosa 24-30-XI-1929 (MCZ), 1♂ 2♀, Bidens pilosa, 4-5-XII-1929
 (D. J. Nicholson, USNM); 1♂ 2♀, bred from Bidens pilosa, X-1930
 (D. J. Nicholson, FSCA); Seminole Co.: Winter Park, 4♂, light

trap, 20-X-1940 (H. T. Fernald, FSCA); St. Lucie, Co.: Ft. Pierce, 3♂, bred from Bidens pilosa, 17-18-XI-1930 (J. G. Grover, USNM); Volusia Co.: Daytona, 1♀, 7-IV-1919 (MCZ); 5♂, bred from Bidens pilosa, 3-8-VII-1930 (C. F. Benjamin, USNM).

Extremely common and widespread species in the genus.

Although the wing pattern of insecta is very similar to that of chrysura in having 3 dark rays in cell Cu_1 , it can be distinguished from the latter by the proximal ray, which extends only to the middle of vein $Cu_2 + 2nd\ A.$; the presence of only 1 hyaline area in cell 1st M_2 ; and by the bicolored pleurae. The hyaline spots in between veins R_{4+5} and vein M_{1+2} may vary in size and shapes. In some specimens, the proximal spot is totally absent. This species commonly breeds in the flower heads of Bidens pilosa. The immature stages were described by Benjamin (1934). Phillips (1946) discussed in detail the larval morphology.

Xanthaciura tetraspina (Phillips)

Figs. 66, 115, 167

Aciura (Eucosmoptera) tetraspina Phillips, 1923, J. N.Y.

Entomol. Soc. 21:132, Fig. 16. Holotype ♀. Type locality: Columbia, Montana.

Slightly smaller than chrysura and insecta. Thorax black entirely; scutellum with 2 pairs of scutellars, the apical pair short. Wing with 3 dark rays arising from dark field in cell 1st M_2 extending only to middle of cell Cu_1 . Vein R_{2+3} normal. The 3 hyaline spots between veins R_{4+5} and M_{1+2} more or less rounded.

Cell R always with a hyaline spot. Abdomen largely yellowish, tergites III-V dark brown. Ovipositor sheath dark brown, basal edge yellowish measured about 0.8 mm. The piercer short and slightly bulged medially, about 0.7 mm long, apex gradually tapers to a sharp point. Extended ovipositor 2.2 mm long. Male genitalia as in Fig. 115. Epan-drium highly arched with scattered setae dorsal and laterally. Surstyli truncate and curved inward at apices. Proctiger small and elongate with fine short setae lateroventrally.

Length: body 2.6-3.2 mm: wing 2.3-3.2 mm (N=8).

Hosts: Ageratum houstonianum Mill.

Balduina angustifolia (Pursh) Robinson

Bidens laevis (L.) BSP

Bidens pilosa L.

Eupatorium coelestinum

Distribution: Utah to Indiana, south to northern Mexico and Florida.

Florida Records: Lake Co.: Tavares, 3♂ 3♀, bred from Bidens pilosa, 24-26-VI-1930 (E. T. Evans, USNM); Marion Co.: Ocala, 3♂ 2♀, ex Bidens laevis, 23-25-XI-1929 (F. Walker, USNM), Orange Co.: Orlando, 5♂ 3♀, bred from Balduina angustifolia, 12-20-XI-1929 (D. J. Nicholson, USNM); 5♂ 8♀, bred from Ageratum houstonianum, 26-30-XII-1929 (D. J. Nicholson, USNM); 3♂ 1♀, bred from Ageratum houstonianum, 8-VII-1930 (D. J. Nicholson, FSCA); 3♂ 3♀, bred from Ageratum houstonianum, 5-15-VIII-1930 (D. J. Nicholson, USNM); 6♂ 14♀, bred from Ageratum houstonianum, 16-22-IX-1930 (D. J. Nicholson, USNM) 12♂ 10♀, bred from Ageratum houstonianum, 1-10-X-1930 (D. J. Nicholson, USNM).

Easily recognized by the characters presented in the key, tetraspina is further characterized by having an entirely black thorax and by having vein R_{2+3} normal. The known distribution of this species suggests that in Florida, it probably does not occur further south than central Florida.

Genus Zonosemata Benjamin

Zonosemata Benjamin, 1934, U.S. Dept. Agric. Tech. Bull. 401:17-18. Type species: Trypeta electa Say.

Readily differentiated from other Trypetinae by the predominantly yellow thorax with black maculations, a cream colored notopleural stripes, and brown crossbands on the wing. All head and body bristles black, with the vertex of the head much narrower than width of the eyes. Usually 2 pairs of upper fronto-orbitals and 4 pairs of lower fronto-orbitals are present on the head. Dorsocentral bristles closer to a transverse line drawn between postalars than to anterior supra-alars. Scutellum cream, tinged with yellow except for 2 black spots at the lateral margin, with 2 pairs of long black bristles. Wing consists of brown transverse band, at level with upper 1/2 of subcostal cell, extending to cubical cell, 2nd and 3rd band in line with r-m and m crossveins, and a band over the upper 1/2 of the apical margin of the wing. Vein R_{4+5} setulose. Abdomen entirely yellow, rather thickly covered with brown-black decumbent setae. The 5th terga with a dark brown to black marking on each basalateral margin.

The genus probably originated in Central, possibly South America. Of the 6 species known, 2 species are widely distributed and abundant in the United States; only 1 species is reported from Florida. The biology of the 2 species has been discussed in some detail by several authors: Peterson (1923), Benjamin (1934), Burdette (1935), Cazier (1962), and Foott (1963). The latest revision of the genus is that of Bush (1965).

Zonosemata electa (Say)

Figs. 67, 116, 168

Trypeta electa Say, 1830, J. Acad. Nat. Sci. Phila.

6:185-186. Holotype, unknown. Type locality: Indiana.

Easily differentiated from other known members of this genus by having only a single pair of dark spots on the 5th terga, and by the lack of black markings before the transverse suture on the dorsum and on the sternopleuron. The median band of wing connected to subapical band along the posterior margin. Scutellum with distinct black spots laterally, just beneath the base of the 1st pair of scutallars. Wing bases and sternopleuron with distinct dark markings. Abdomen predominantly yellow, densely covered with brown decumbent hairs. The ovipositor sheath, yellow, about 1.7 mm long, the apex tinged with dark brown. The piercer slender and sharply pointed at apex, approximately 1.6 mm long. The extended ovipositor 5.0 mm long. Male genitalia as in Fig. 116. Epandrium highly arched, the dorsum yellow tinged with dark brown, covered with numerous long black

setae that spread laterally. Surstyli short and slightly curved inward, the apices rounded; the proctiger large and elongate, with numerous fine setae lateroventrally.

Length: body 6.5-7.6 mm; wing 5.7-6.7 mm. (N=12).

Hosts: Lycopersicon esculentum Mill.

Solanum aculeatissimum Jacq.

Solanum carolinense L.

Distribution: Oklahoma to Ontario and south to eastern Texas and Florida.

Florida Records: Marion Co.: Silver Springs, 1♀, McPhail trap, 29-VI-1967 (E. W. Holder, FSCA); St. Johns Co.: 4♂ 4♀, bred from Solanum aculeatissimum, 18-VIII-1930 (M. Dodd, USNM); Bakersville, 2♂ 2♀, larvae transferred from Solanum carolinense, 29-30-V-1930 (M. Dodd, USNM); Riverdale, 21♂ 6+, bred from Solanum aculeatissimum, 15-25-V-1931 (M. Dodd, USNM); St. Augustine; 6♂ 4♀, bred from Solanum carolinense 9-V-1930 (M. Dodd, USNM); 6♂ 3♀, bred from Solanum carolinense, 14-VI-1930 (M. Dodd, USNM); 1♂ 1♀, bred from Solanum carolinense, 10-VI-1932 (F. S. Blanton, FSCA); Volusia Co.: Daytona Beach, 1♂, Solanum carolinense, 5-12-V-1930 (D. R. Nicholson, USNM); Port Orange, 2♂ 1♀, bred from Solanum aculeatissimum 4-9-IX-1930 (USNM); 8♂ 1♀, bred from Solanum aculeatissimum, 15-29-V-1931 (USNM).

This species can be distinguished further by its size, being generally larger, an average of 7.0 mm. Most specimens studied had 4 pairs of lower fronto-orbitals, but the number varies

with individuals. Commonly known as the pepper maggots, this species is a pest of peppers. Peterson (1923), Benjamin (1934), Phillips (1946), Bush (1966), and Steyskal (1975) presented detailed descriptions of both larval and adult stages.

DISCUSSION AND CONCLUSION

Although considerable information on Florida tephritids exists, it is widely scattered in the literature. In this dissertation, all information pertaining to Florida tephritids, including taxonomic notes, hosts, seasonal distribution, and information on immature stages, is brought together, and keys to genera and species are included.

The hosts of 12 species of Florida Tephritidae are unknown. At least 155 species of plants are known to be hosts of the other 44 species. Of these, 50% are Compositae, which serve as hosts for 29 species in 15 genera of fruit flies. Larvae feed on the developing seeds and destroy all or most of the seeds in each head. The most common tephritids associated with these plants are widespread and generally occur where host plants occur. The Tephritidae associated with Compositae are not considered of economic importance in Florida; their value as biological agents in controlling weeds has not been assessed. This aspect warrants further investigation.

The species of greatest economic importance in Florida and elsewhere infest all kinds of fleshy fruits and vegetables. Cultivated plants in Florida, particularly citrus, peach, and mango, have suffered serious damage from the Caribbean fruit fly, Anastrepha suspensa, and the Mediterranean fruit fly, Ceratitis capitata. Anastrepha suspensa,

introduced from the West Indies, is the most common and widespread species and poses some threat to Florida citrus. Anastrepha species breed in fleshy fruits, and at least 2 species, A. interrupta and A. nigrifascia, are endemic to south Florida.

The Mediterranean fruit fly became established in Florida in 1929, 1956, and 1962. Each time an intensive and expensive control campaign was initiated, and the pest was eradicated from Florida. Continuous trapping, especially in south Florida, hopefully will provide early detection of any new reinfestation.

The genus Rhagoletis is Holarctic in origin and primarily inhabits temperate climates. Its range extends into northern Florida, generally following the distribution of the host plant species. Many of the Florida species and distinct races of plants and animals had their origins as isolated populations during the interglacial period. The hosts of R. osmanthi and R. chionanthi are among the plants which have distinct subspecies associated with the areas of Florida which were affected by the geological changes. Both species are endemic and are found in only a few localities in Florida. Although in North America the genus contains economically important species, the 6 species occurring in Florida are of little economic importance.

The pepper maggot fly, Zonosemata electa, is an important pest in pepper growing areas of the United States and Canada. It causes only minor damage to peppers in Florida since its distribution is generally north of the major pepper growing areas.

Identification of fruit flies has been based primarily on the

characters of the wing, ovipositor, and male genitalia. Wing patterns are used extensively for identification because the characteristic markings are readily visible and in most cases are fairly constant. Most fruit fly species whose courtship or pre-mating behavior have been studied, display their wings to their potential mates. This would explain why the wing patterns are so constant since they are important for intra-specific species recognition. However, there is slight variation in wing pattern for some species in the genus Trupanea. In cases where wing patterns are similar, the ovipositors and/or male genitalia are important characters for distinguishing between species. The ovipositor characteristics are useful particularly in identifying females of the genus Anastrepha. Male genitalia are useful in identification especially with some species of Rhagoletis, Neaspilota, and Dioxyna.

Despite widespread occurrence of many species of tephritids, information on their biology is scarce. Larvae of at least 32 species of Florida tephritids have been described. Of these, 6 are known to be host specific. The larvae of tephritids are divided into 2 basic shapes: muscidiform, which is typical of those attacking fleshy fruits and some vegetables, and a shortened barrel-shaped body, typical of gall makers and some species that breed in composite flower-heads. Little is known about the larvae of the remaining 24 species of Florida tephritids. Much more collecting and rearing are necessary before we will have a good understanding of the biologies and host ranges of our Florida species.

Studies on the diversity of plant and animal groups in peninsular Florida have indicated that Florida has been an area for the evolution

and dispersion of flora and fauna of the southeastern Coastal Plain.

This situation is due to many factors, including the geographical position and the physical and geological history of the state. It is not surprising that 56 species of the approximately 4,000 species of fruit flies known throughout the world occur in Florida. At least 8 genera appear to have originated in the Neotropics, 11 genera are Nearctic, 3 genera presumably Palearctic, 2 genera Holarctic, and 1 genus is Ethiopian in origin. Of the 25 genera of Tephritidae known from Florida, 17 have representatives in the West Indies and/or Central America and 8 have representatives elsewhere in North America. Of the 56 Florida species, 12 are endemic to Florida. At least 31 species occur in other parts of the United States, while 13 species are common to Florida and West Indies. It is likely that some of these eventually will be found in neighboring states or in the West Indies.

Wing Patterns of Florida Tephritidae

- Fig. 12. Acidogona melanura (Loew), ♀
Fig. 13. Acinia fucata (Fabricius), ♀
Fig. 14. Acrotaenia testudinea (Loew) (Loew), ♀
Fig. 15. Anastrepha edentata Stone, ♀
Fig. 16. Anastrepha interrupta Stone, ♀
Fig. 17. Anastrepha nigrifascia Stone, ♀
Fig. 18. Anastrepha obliqua (Macquart), ♀
Fig. 19. Anastrepha ocesia (Walker), ♀
Fig. 20. Anastrepha suspensa (Loew), ♀
Fig. 21. Ceratitis capitata (Wiedemann), ♀



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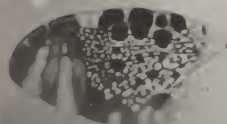
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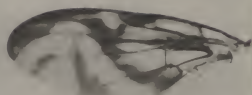
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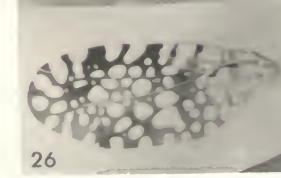
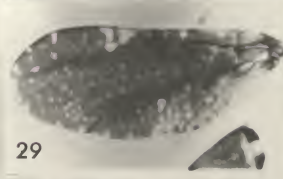
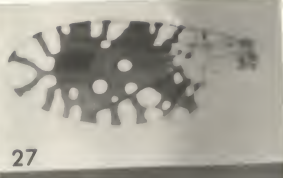
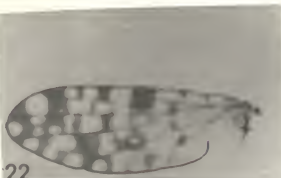


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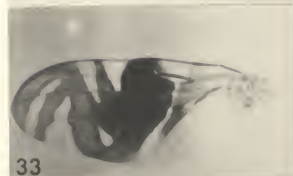


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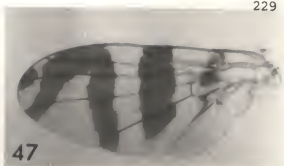
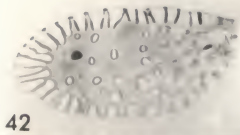
- Fig. 22. Dioxyna picciola (Bigot), ♀
Fig. 23. Dioxyna thomae (Curran), ♀
Fig. 24. Dyseuresta mexicana (Wiedemann), ♀
Fig. 25. Euleia fratria (Loew), ♂
Fig. 26. Euaresta aequalis (Loew), ♀
Fig. 27. Euaresta bella (Loew), ♀
Fig. 28. Euarestoides abstersus (Loew), ♀
Fig. 29. Eurosta comma (Wiedemann), ♀
Fig. 30. Eurosta donysa (Walker), ♀
Fig. 31. Eurosta fenestrata Snow, ♂



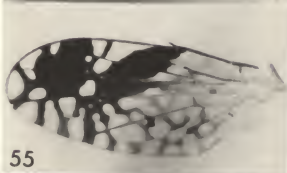
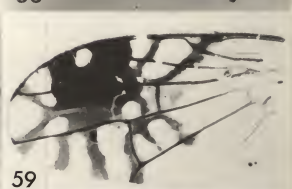
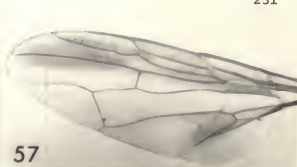
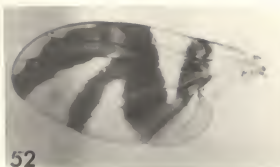
- Fig. 32. Eurosta floridensis Foote, ♀
- Fig. 33. Myoleja limata (Coquillett), ♀
- Fig. 34. Myoleja nigricornis (Doane), ♂
- Fig. 35. Myoleja rhino Steyskal, ♀
- Fig. 36. Neaspilota achilleae (Loew), ♀
- Fig. 37. Neaspilota dolosa Benjamin, ♀
- Fig. 38. Neaspilota floridana Rohani, n.sp., ♀
- Fig. 39. Neaspilota punctistigma Benjamin, ♀
- Fig. 40. Neaspilota vernoniae (Loew), ♀
- Fig. 41. Parancantha culta (Wiedemann), ♀



- Fig. 42. Paracantha forficula Benjamin, ♀
- Fig. 43. Peronyma sarcinata (Loew), ♀
- Fig. 44. Procecidochares atra (Loew), ♂
- Fig. 45. Procecidochares australis Aldrich, ♀
- Fig. 46. Procecidochares polita (Loew), ♀
- Fig. 47. Rhagoletis cingulata cingulata (Loew), ♀
- Fig. 48. Rhagoletis chionanthi Bush, ♀
- Fig. 49. Rhagoletis osmanthi Bush, ♀
- Fig. 50. Rhagoletis pomonella (Walsh), ♀
- Fig. 51. Rhagoletis cornivora Bush, ♀



- Fig. 52. Rhagoletis mendax Curran, ♀
- Fig. 53. Stenopa vulnerata (Loew), ♀
- Fig. 54. Strauzia longipennis Wiedemann, ♀
- Fig. 55. Tephritis subpura (Loew), ♀
- Fig. 56. Tomoplagia obliqua (Say), ♀
- Fig. 57. Toxotrypana curvicauda Gerstaecker, ♀
- Fig. 58. Trupanea actinobola (Loew), ♀
- Fig. 59. Trupanea ageratae Benjamin, ♂
- Fig. 60. Trupanea dacetoptera. ♀
- Fig. 61. Trupanea eclipta Benjamin, ♀



- Fig. 62. Trupanea mevarna Walker, ♀
- Fig. 63. Xanthaciura chrysura (Thomson), ♀
- Fig. 64. Xanthaciura connexionis Benjamin, ♀
- Fig. 65. Xanthaciura insecta (Loew), ♀
- Fig. 66. Xanthaciura tetrapina (Phillips), ♀
- Fig. 67. Zonosemata electa (Say), ♀



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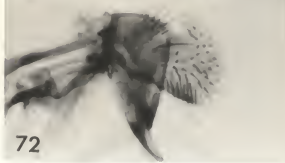
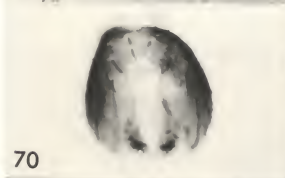
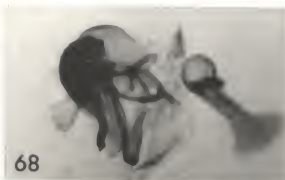
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Male Genitalia of Florida Tephritidae

- Fig. 68. Acidogona melanura (Loew)
Fig. 69. Acinia fucata Fabricias
Fig. 70. Acrotaenia testudinea (Loew)
Fig. 71. Anastrepha edentata Stone
Fig. 72. Anastrepha interrupta Stone
Fig. 73. Anastrepha nigrifascia Stone
Fig. 74. Anastrepha obliqua (Macquart)
Fig. 75. Anastrepha suspensa (Loew)
Fig. 77. Dioxyna picciola (Bigot)



- Fig. 78. Dioxyna thomae (Curran)
- Fig. 79. Dyseuaresta mexicana (Wiedemann)
- Fig. 80. Euleia fratria (Loew)
- Fig. 81. Euaresta aequalis (Loew)
- Fig. 82. Euaresta bella (Loew)
- Fig. 83. Euarestoides abstersus (Loew)
- Fig. 84. Eurosta comma (Wiedemann)
- Fig. 85. Eurosta donysa (Walker)
- Fig. 86. Eurosta fenestrata Snow
- Fig. 87. Myoleja limata (Coquillett)

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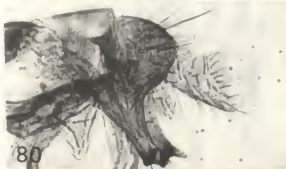
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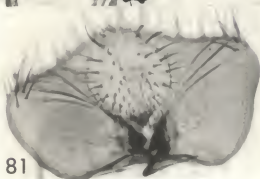


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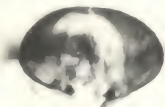
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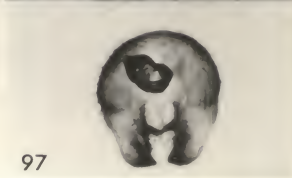
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- Fig. 88. Myoleja nigricornis (Doane)
- Fig. 89. Myoleja rhino Steyskal
- Fig. 90. Neaspilota achilleae Johnson
- Fig. 91. Neaspilota dolosa Benjamin
- Fig. 92. Neaspilota floridana Rohani n.sp.
- Fig. 93. Neaspilota punctistigma Benjamin
- Fig. 94. Neaspilota vernoniae (Loew)
- Fig. 95. Paracantha culta (Wiedemann)
- Fig. 96. Paracantha forficula Benjamin
- Fig. 97. Peronyma sarcinata (Loew)



- Fig. 98. Procecidochares atra (Loew)
- Fig. 99. Procecidochares australis Aldrich
- Fig. 100. Rhagoletis cingulata cingulata (Loew)
- Fig. 101. Rhagoletis osmanthi Bush
- Fig. 102. Rhagoletis pomonella (Walsh)
- Fig. 103. Rhagoletis mendax Curran
- Fig. 104. Stenopa vulnerata (Loew)
- Fig. 105. Strauzia longipennis (Wiedemann)
- Fig. 106. Tephritis subpura (Johnson)
- Fig. 107. Tomoplagia obliqua (Say)



- Fig. 108. Trupanea actinobola (Loew)
- Fig. 109. Trupanea dacetoptera Phillips
- Fig. 110. Trupanea eclipta Benjamin
- Fig. 111. Trupanea mevarna (Walker)
- Fig. 112. Xanthaciura chrysura (Thomson)
- Fig. 113. Xanthaciura connexionis Benjamin
- Fig. 114. Xanthaciura insecta (Loew)
- Fig. 115. Xanthaciura tetraspina (Phillips)
- Fig. 116. Zonosemata electa (Say)

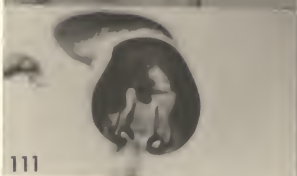


Fig. 117. Distribution map of Acidogona melanura (Loew);
specific locality record (●).

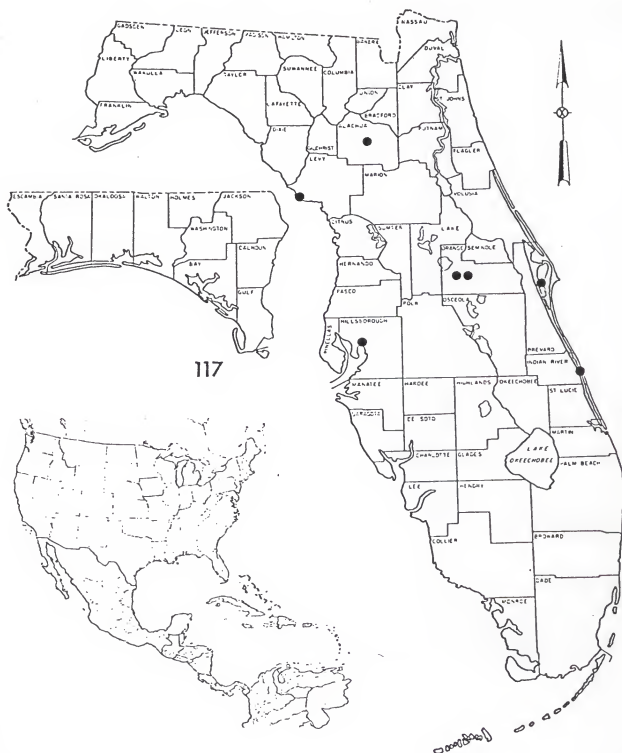


Fig. 118. Distribution of map Acinia fucata (Fabricius);
Specific locality record (●), county record (■).

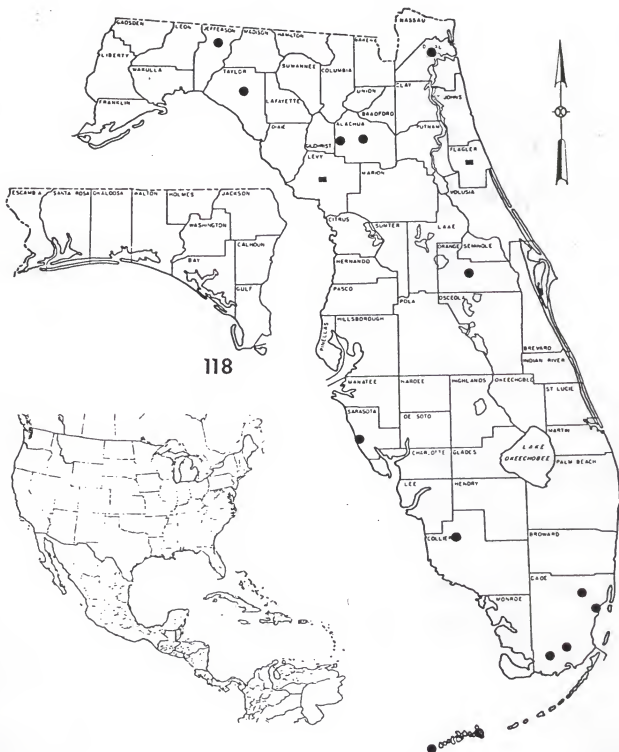


Fig. 119. Distribution map of Acrotaenia testudinea (Loew),
specific locality record (●).

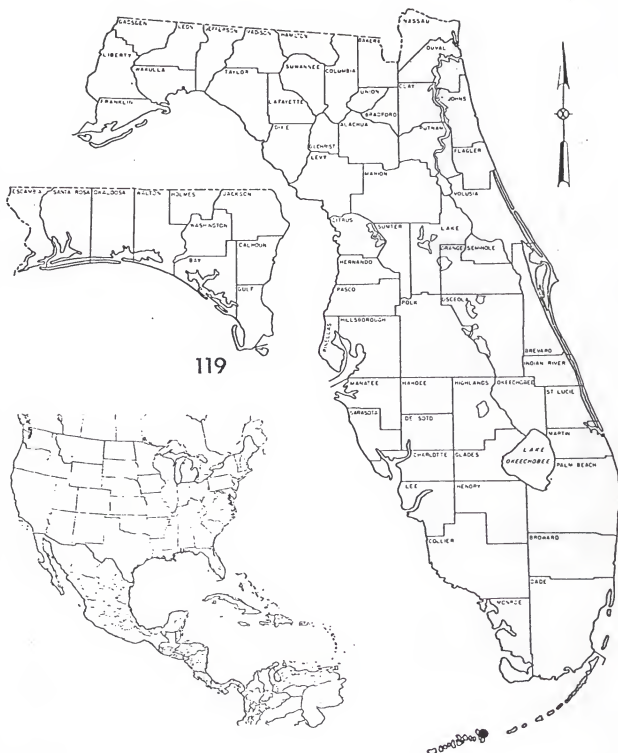


Fig. 120. Distribution map of Anastrepha edentata Stone;
specific locality record (●), county record(■).

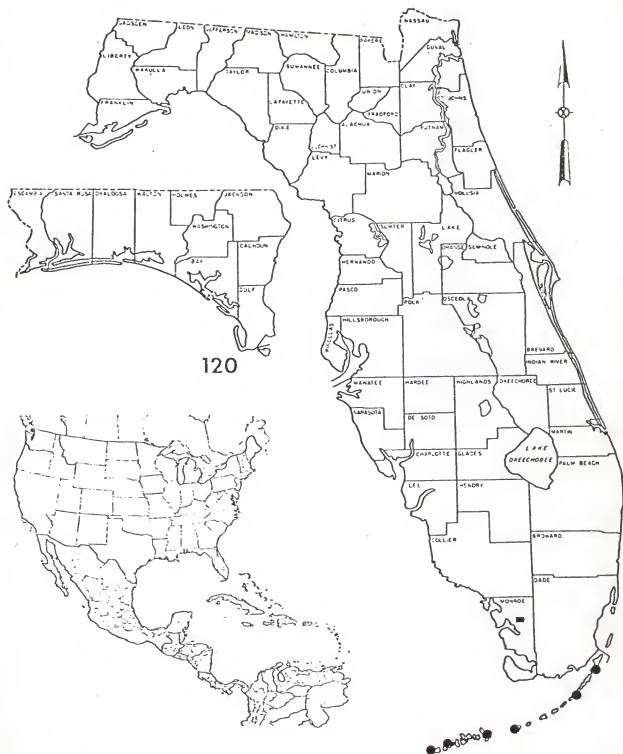


Fig. 121. Distribution map of Anastrepha interrupta Stone;
specific locality record (●), county record (■).

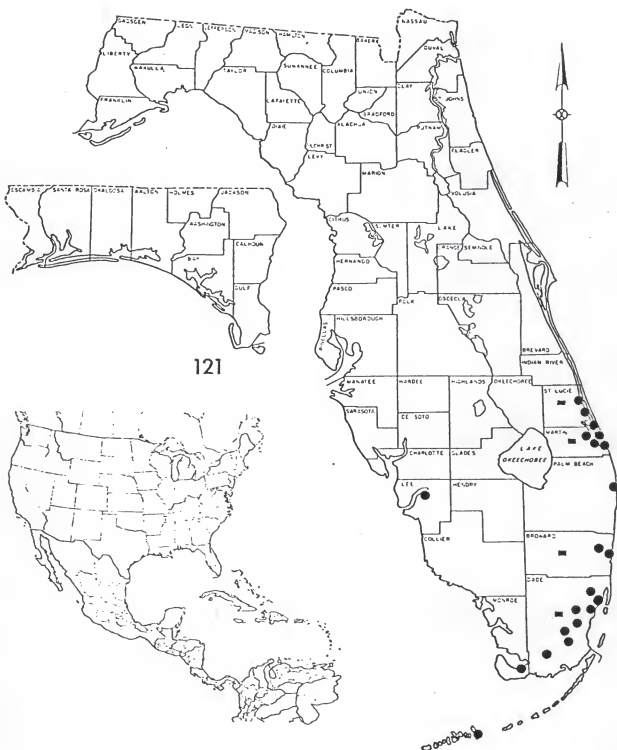


Fig. 122. Distribution map of Anastrepha nigrifascia Stone;
specific locality record (●).

Fig. 123. Distribution map of Anastrepha obliqua (Macquart);
specific locality record (●).

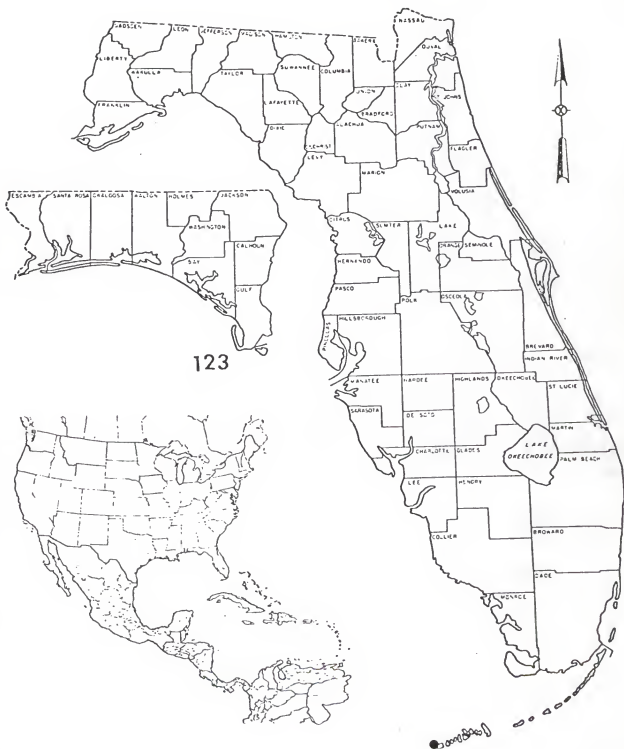


Fig. 124. Distribution map of Anastrepha ocrexia (Walker);
specific locality record (●).

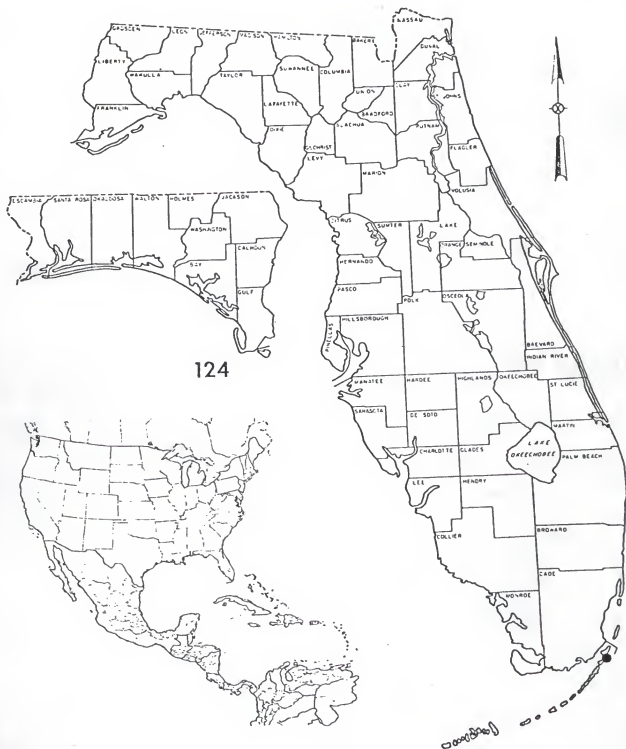


Fig. 125. Distribution map of Anastrepha suspensa (Loew);
specific locality record (●), county record (■).

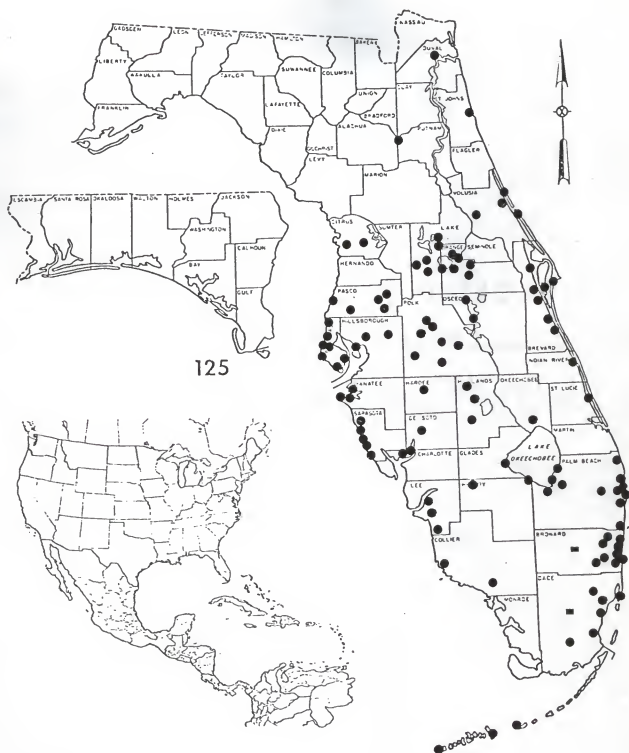


Fig. 126. Distribution map of Ceratitis capitata (Wiedemann);
specific locality record (●), county record (■).

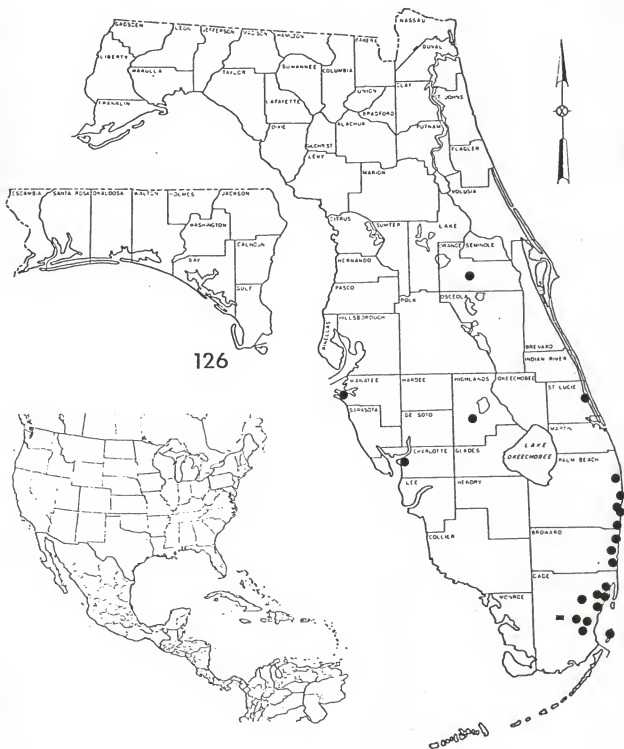
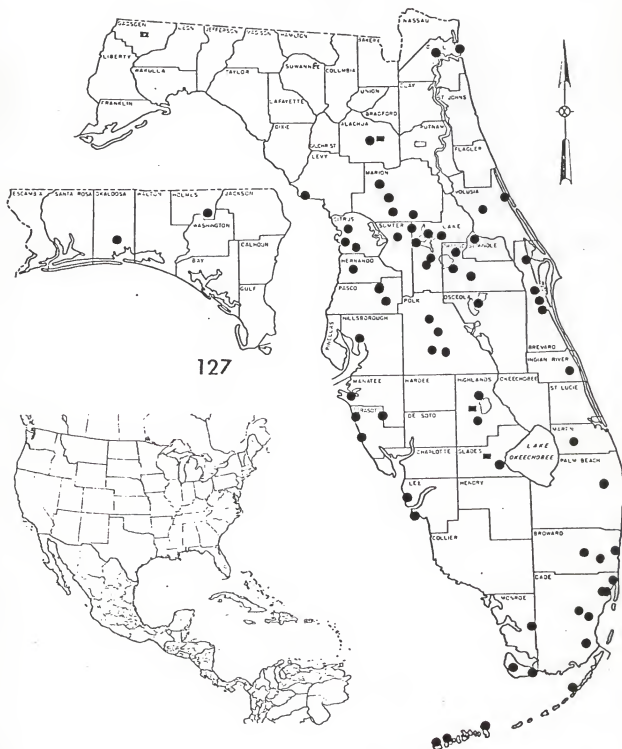


Fig. 127. Distribution map of Dioxyna picciola (Bigot);
specific locality record (●), county record (■).



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Fig. 128. Distribution map of Dioxyna thomae (Curran);
specific locality record (●), county record (■).

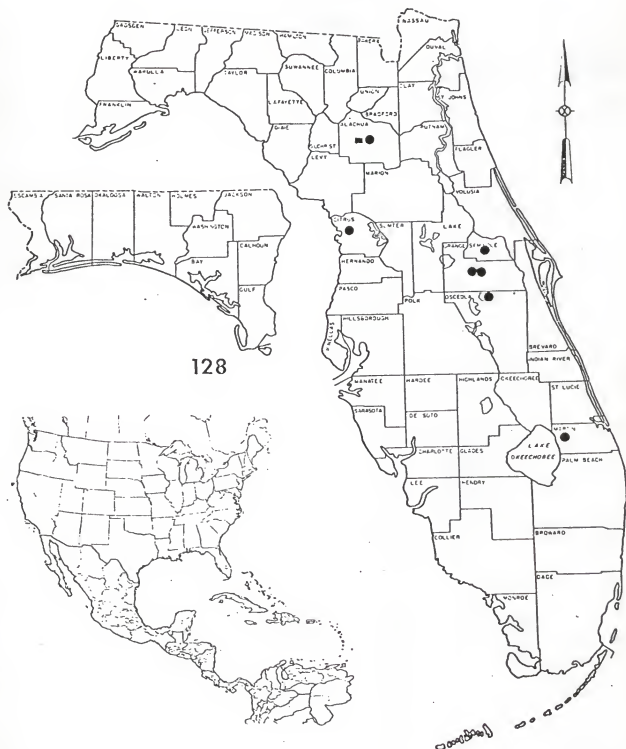


Fig. 129. Distribution map of Dyseuaresta mexicana (Wiedemann);
specific locality record (●), county record (■).

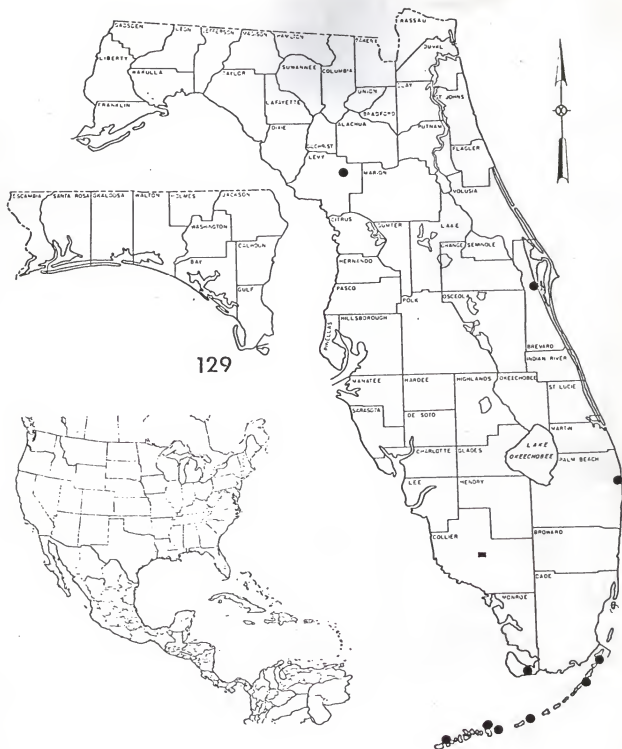


Fig. 130. Distribution map of Euleia fratria (Loew);
specific locality record (●).

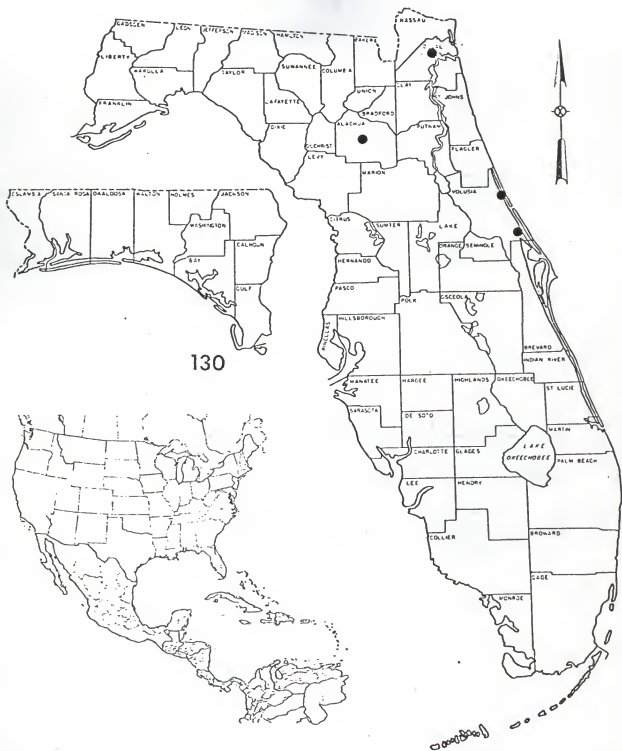


Fig. 131. Distribution map of Euaresta aequalis (Loew);
specific locality record (●).

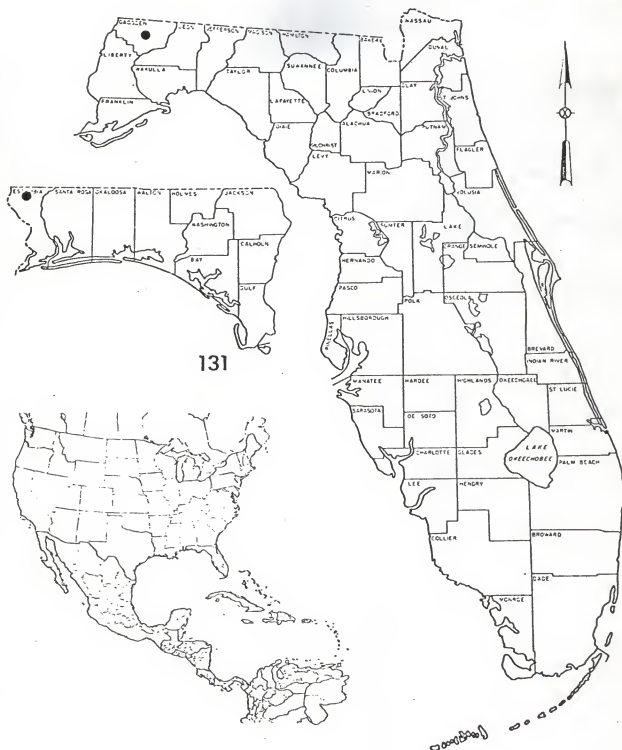


Fig. 132. Distribution map of Euaresta bella (Loew);
specific locality record (●), county record (■).

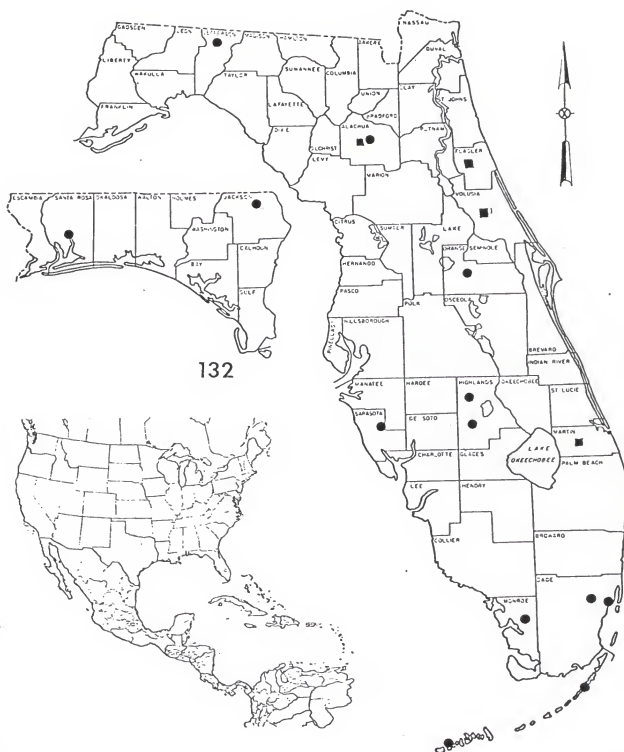


Fig. 133. Distribution map of Euarestoides abstersus (Loew):
specific locality record (●).

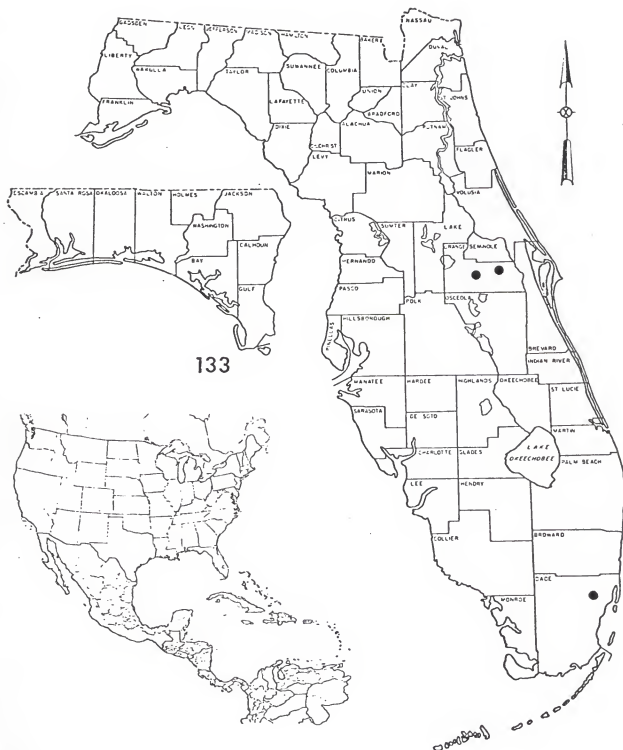


Fig. 134. Distribution map of Eurosta comma (Wiedemann),
specific locality record (●).

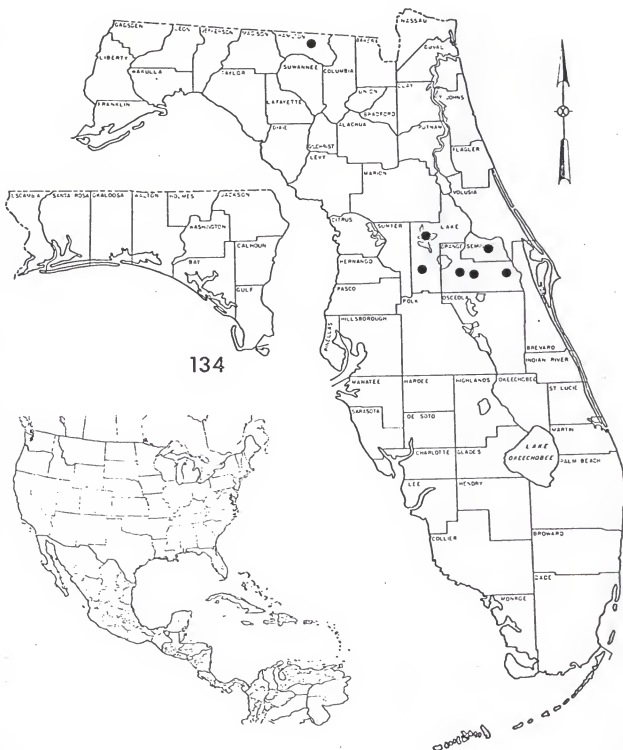


Fig. 135. Distribution map of Eurosta donysa (Walker);
specific locality record (●).

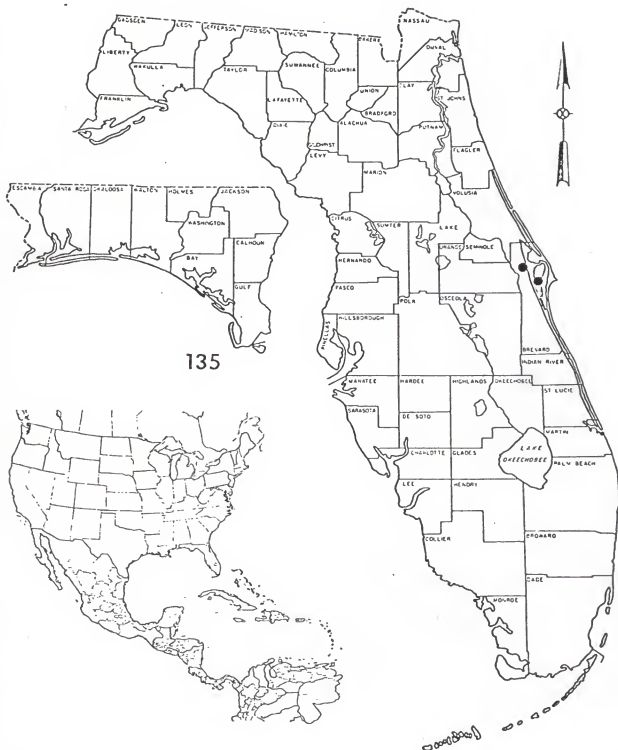


Fig. 136 Distribution map of Eurosta fenestrata Snow;
specific locality record (●).

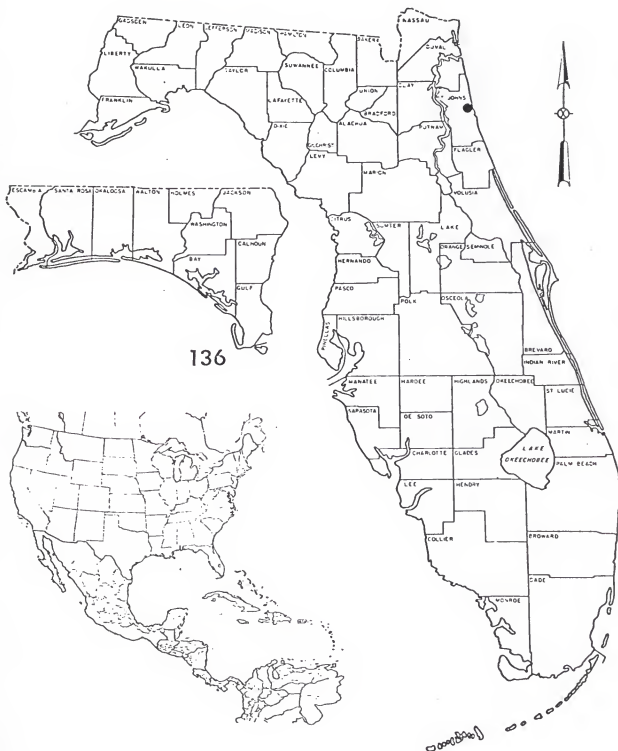


Fig. 137. Distribution map of Eurosta floridensis Foote;
specific locality record (●).

Fig. 138. Distribution map of Myoleja limata (Coquillett);
specific locality record (●), county record (■).

Fig. 139. Distribution map of Myoleja rhino (Steyskal;
specific locality record (●), county record (■).

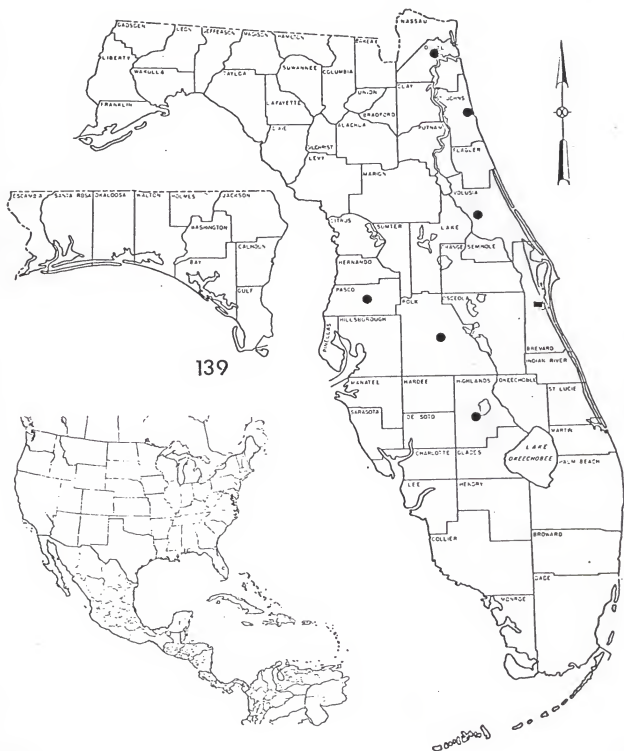


Fig. 140. Distribution of Neaspilota achilleae Johnson;
specific locality record (●).

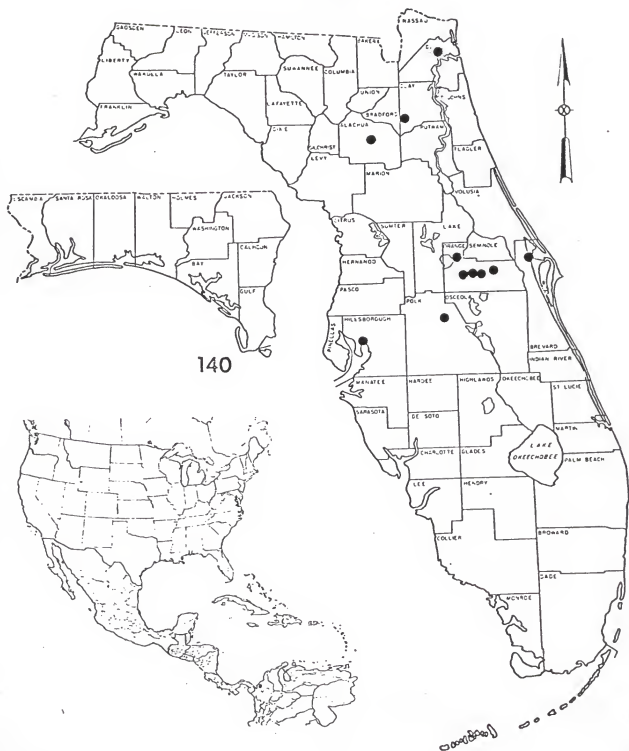


Fig. 141 Distribution map of Neaspilota dolosa Benjamin;
specific locality record (●), county record (■).

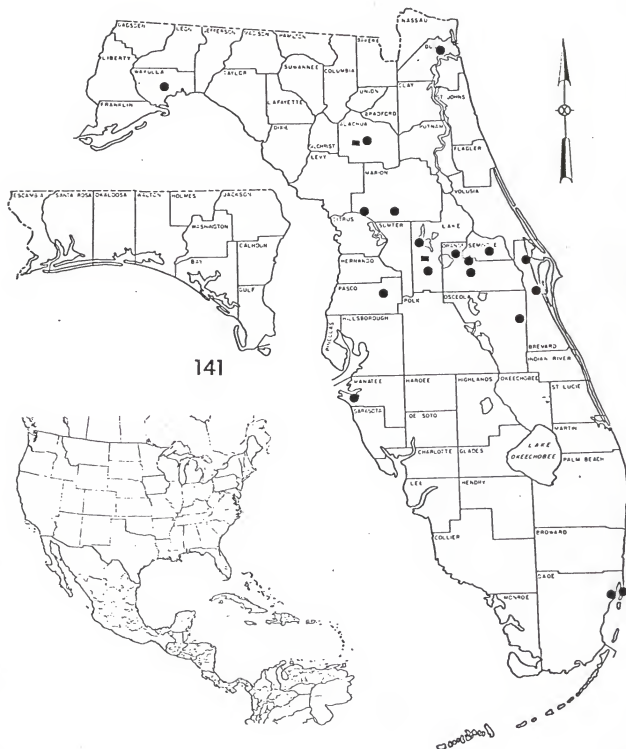


Fig. 142. Distribution map of Neaspilota floridana Rohani, n.sp.
specific locality record (●).

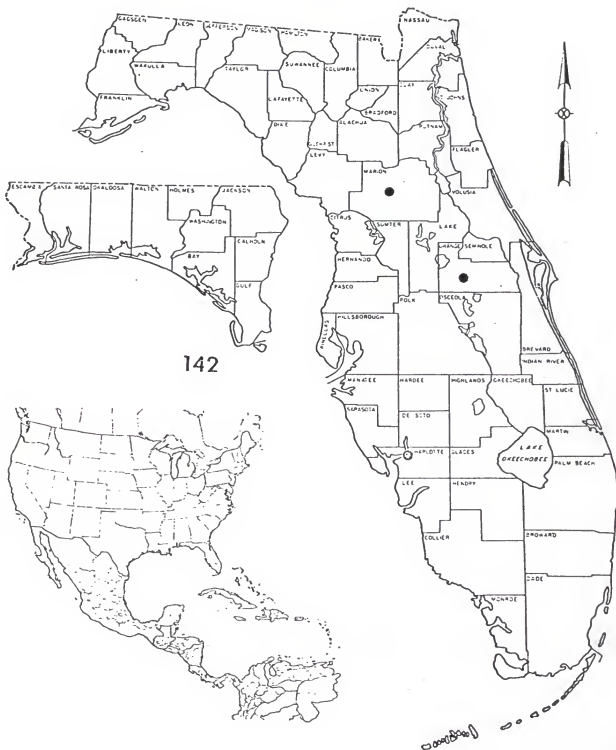


Fig. 143. Distribution map of Neaspilota punctistigma Benjamin;
specific locality record (●), county record (■) .

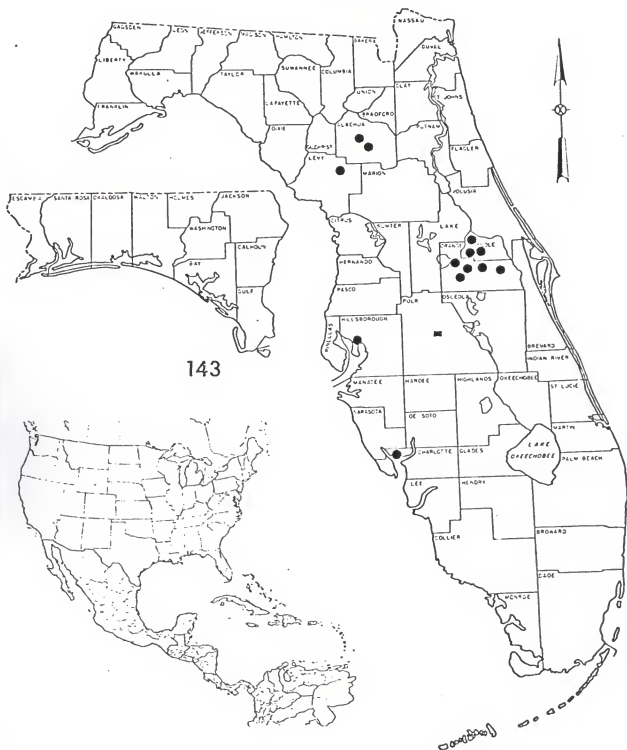


Fig. 144. Distribution map of Paracantha culta (Wiedemann);
specific locality record (●), county record (■).

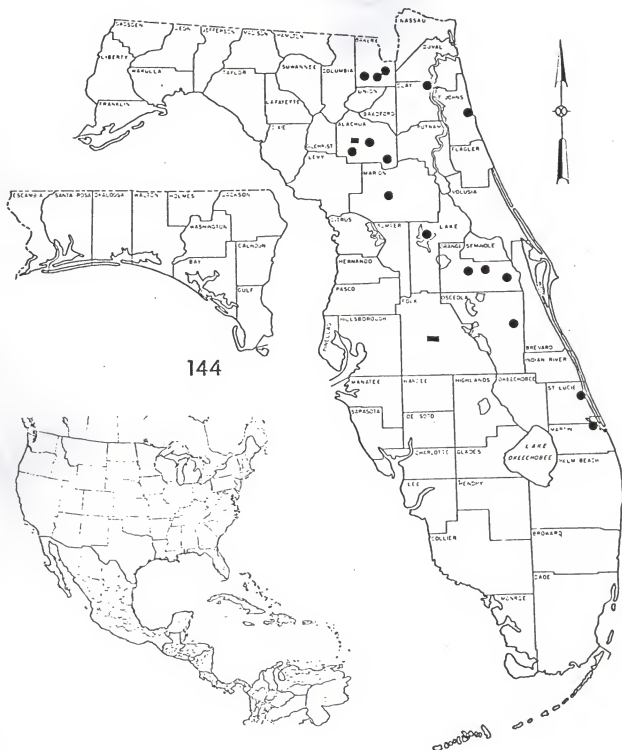


Fig. 145. Distribution map of Paracantha forficula Benjamin;
specific locality record (●).

Fig. 146. Distribution map of Peronyma sarcinata (Loew);
specific locality record (●).

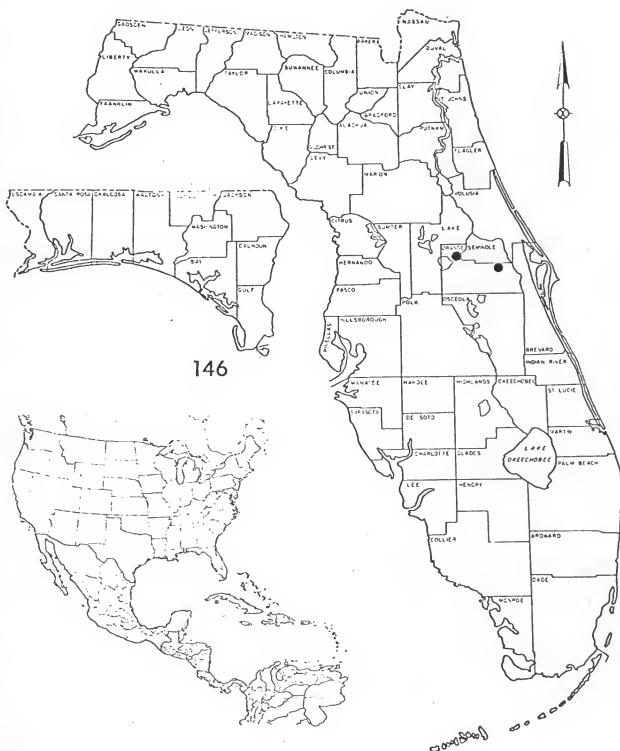


Fig. 147. Distribution map of Procecidocharaes australis Aldrich;
specific locality record (●).

Fig. 148. Distribution map of Procecidochara polita (Loew);
specific locality record (●).

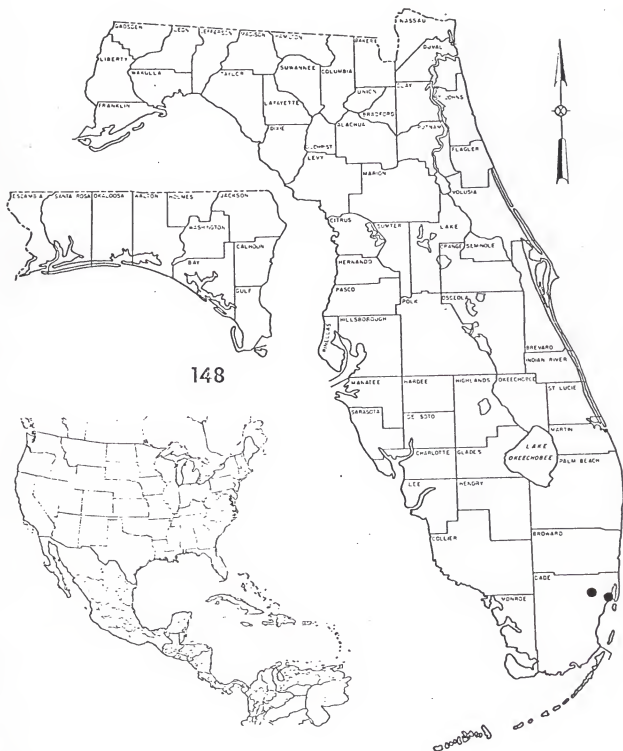


Fig. 149. Distribution map of Rhagoletis cingulata cingulata
(Loew); specific locality record (●).

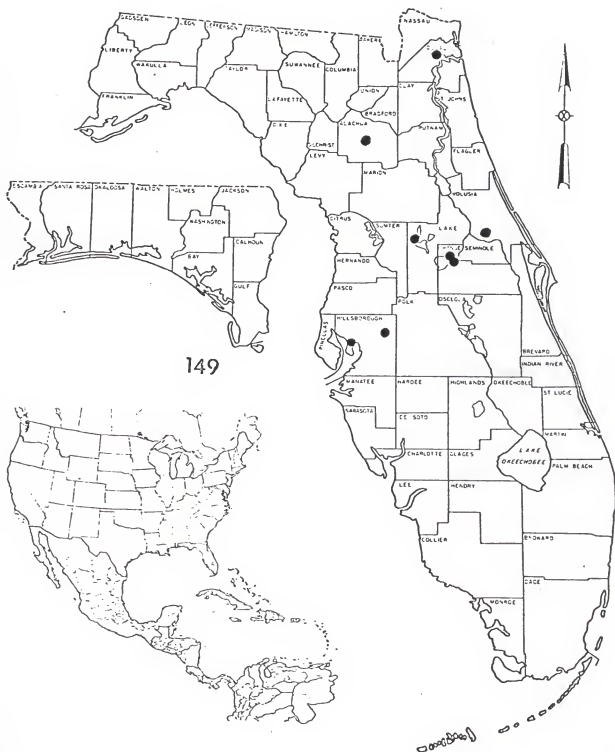


Fig. 150. Distribution map of Ragoletis chionanthi Bush;
specific locality record (●), county record (■).

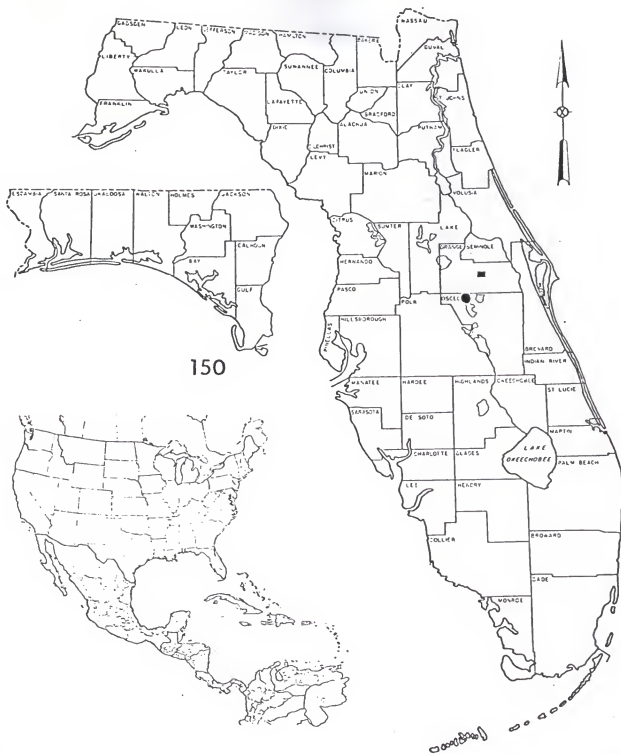


Fig. 151. Distribution map of Rhagoletis osmanthi Bush;
specific locality record (●), county record (■)

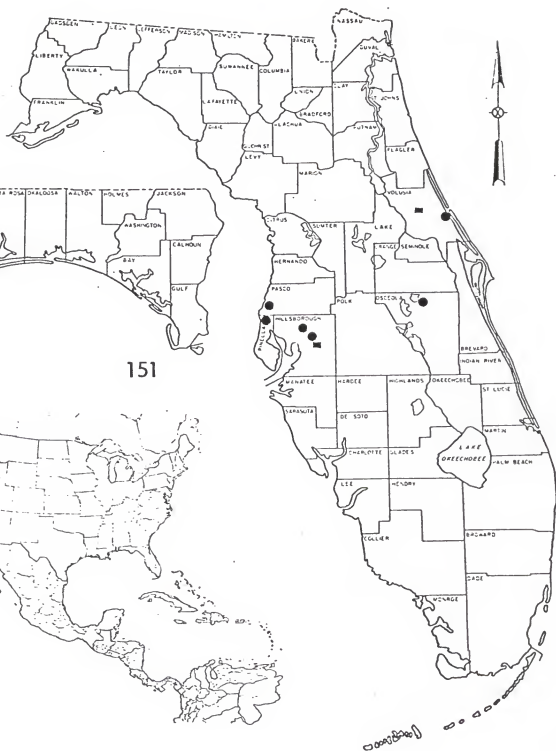


Fig. 152. Distribution map of Rhagoletis pomonella (Walsh);
specific locality record (●).

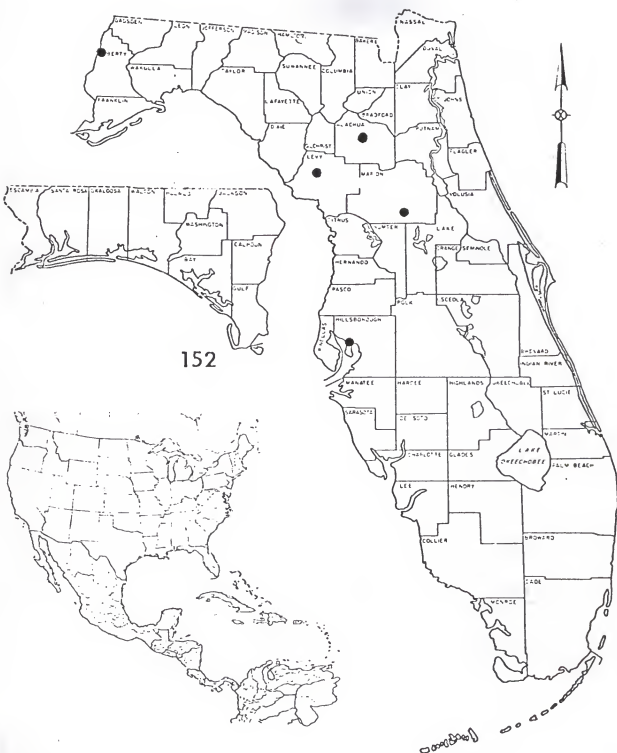


Fig. 153. Distribution map of Ragoletis cornivora Bush;
specific locality record (●).

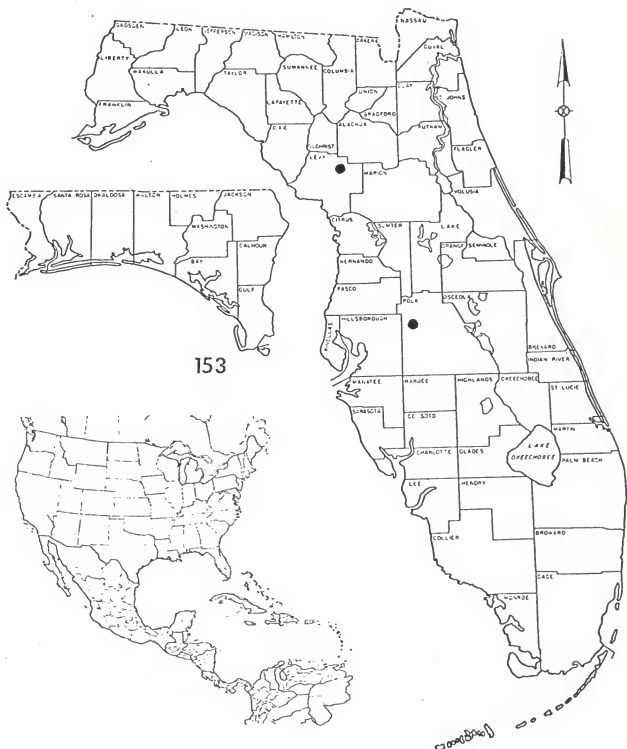


Fig. 154. Distribution map of Rhagoletis mendax Curran;
specific locality record (●), county record (■).

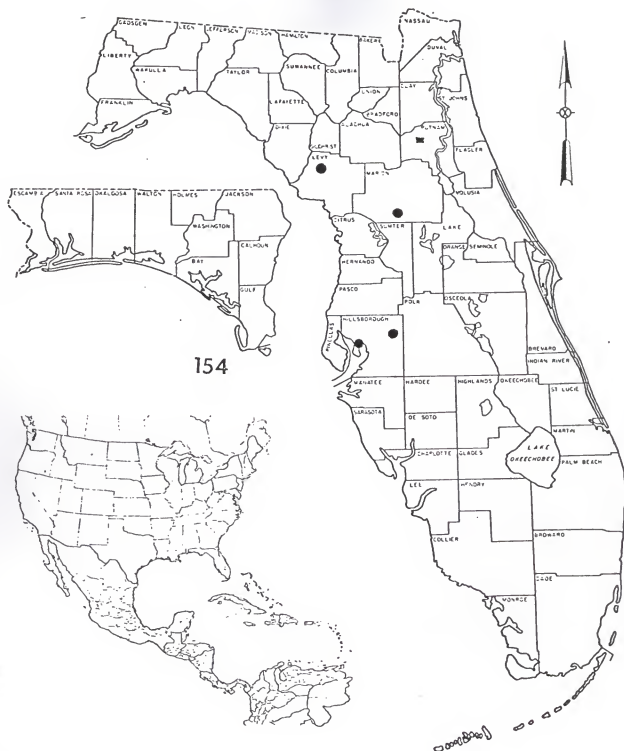


Fig. 155. Distribution map of Strauzia longipennis (Wiedemann);
specific locality record (●).

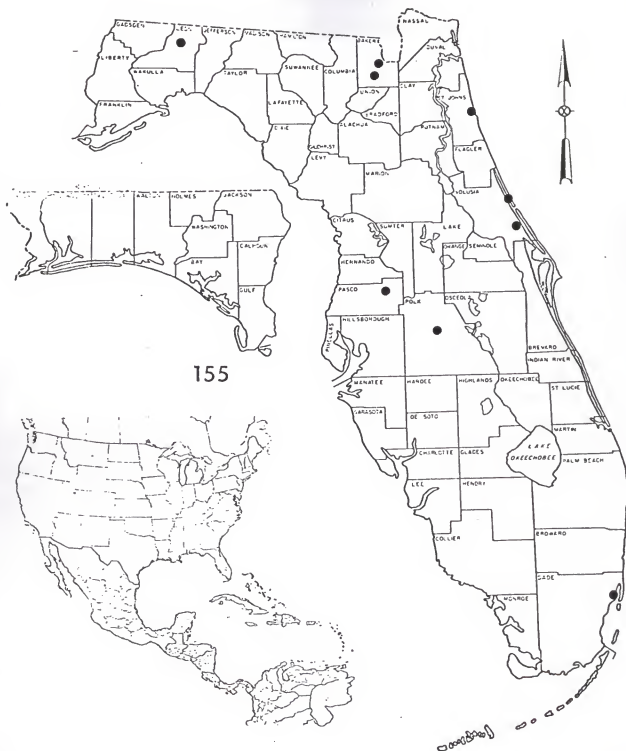


Fig. 156. Distribution map of Tephritis subpura (Loew);
specific locality record (●), county record (—).

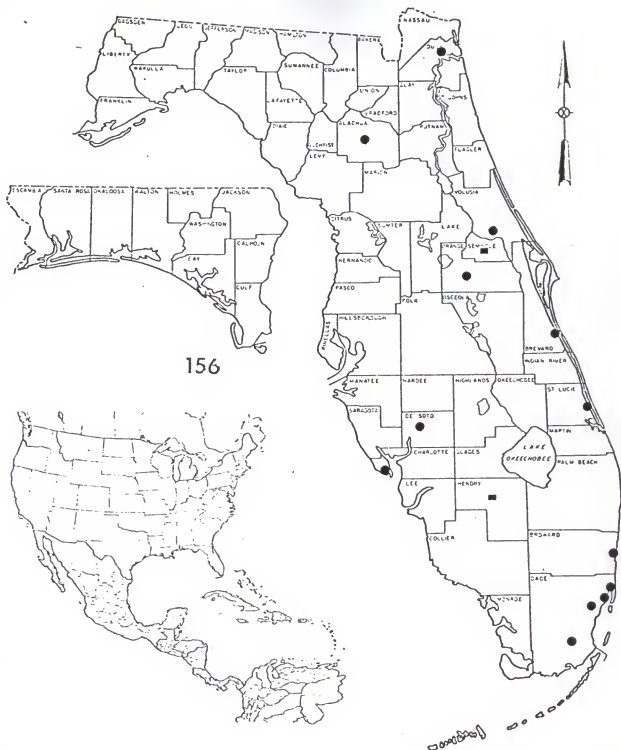


Fig. 157. Distribution map of Tomoplagia obliqua
specific locality record (●), county record (■).

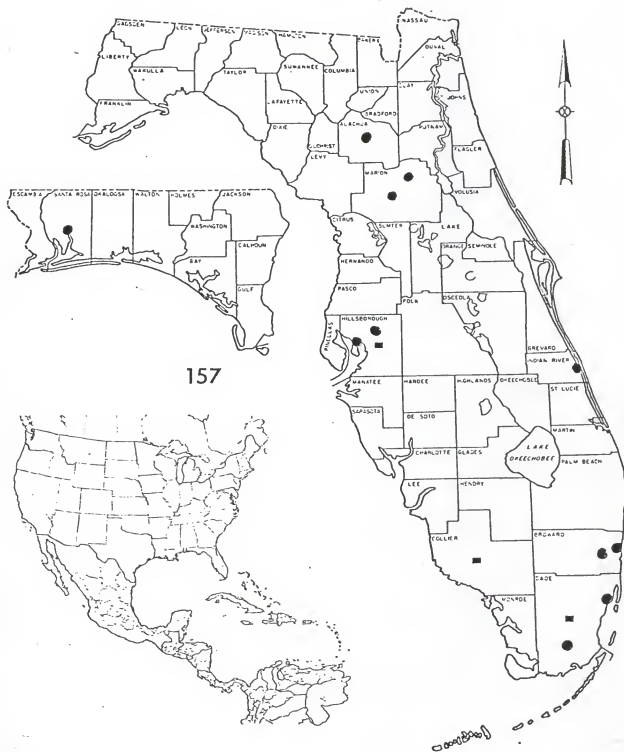


Fig. 158. Distribution map of Toxotrypana curvicauda Gerstacker;
specific locality record (●); county record (■).

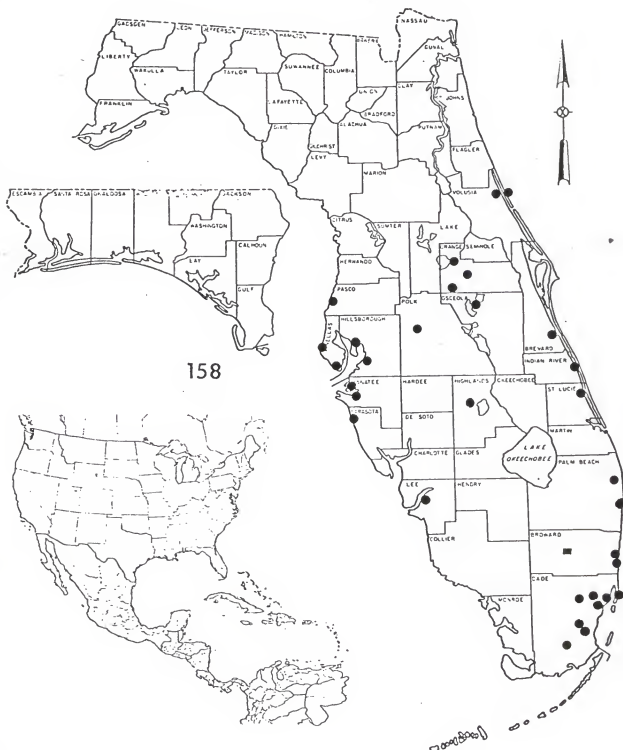


Fig. 159. Distribution map of Trupanea actinobola (Loew);
specific locality record (●), county record. (■).

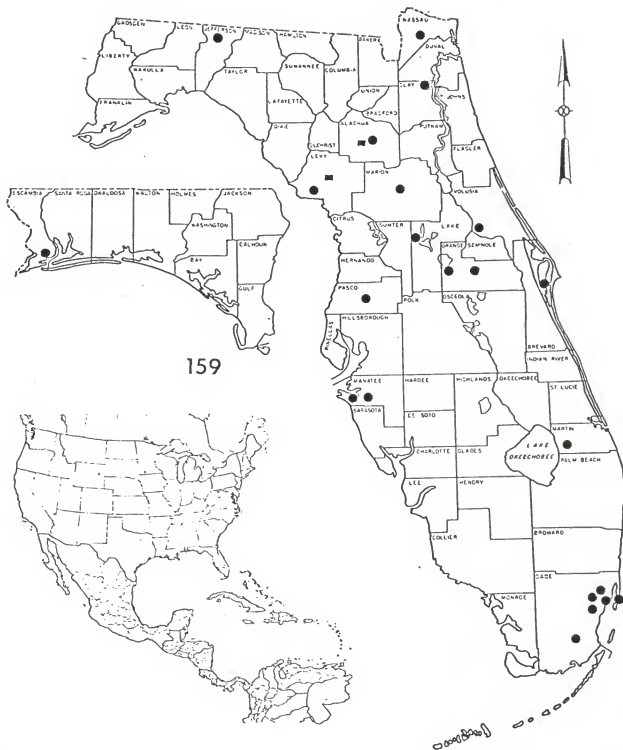


Fig. 160. Distribution map of Trupanea ageratae Benjamin;
specific locality record (●).

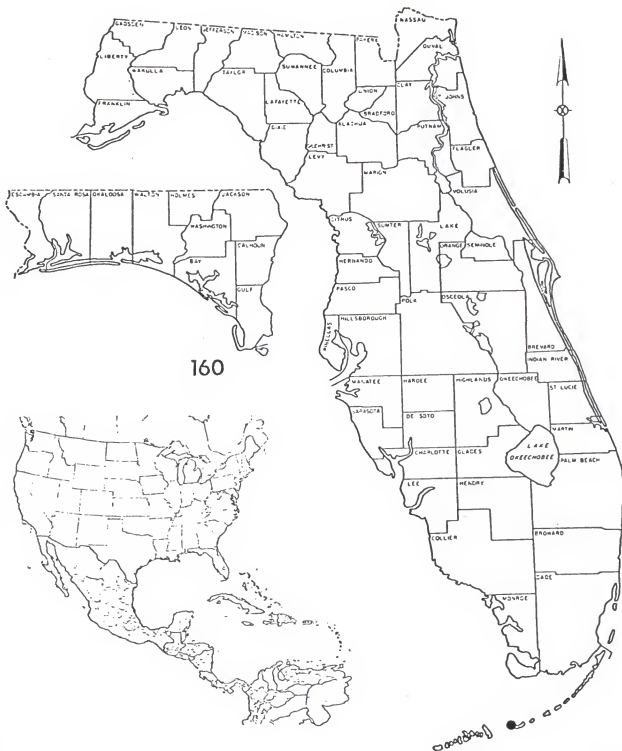


Fig. 161. Distribution map of Trupanea dacetoptera Phillips;
specific locality record (●).

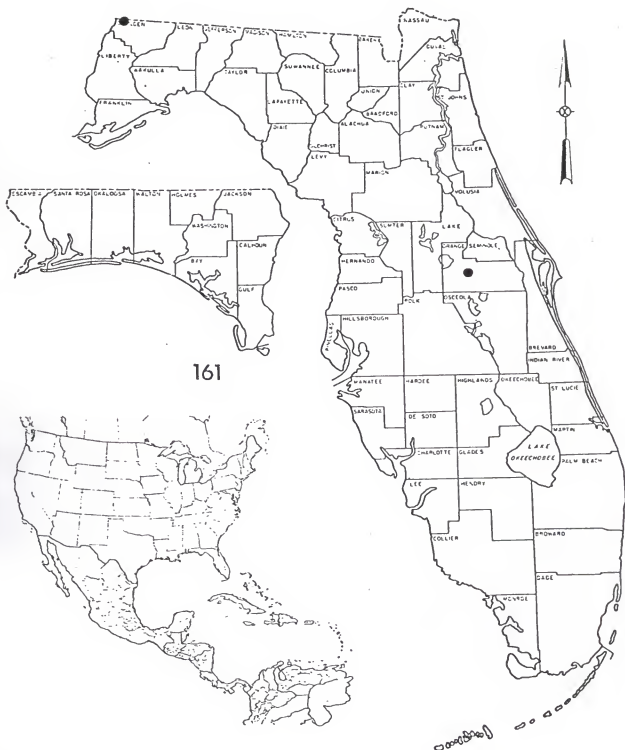


Fig. 162. Distribution map of Trupanea eclipta Benjamin
specific locality record (●).

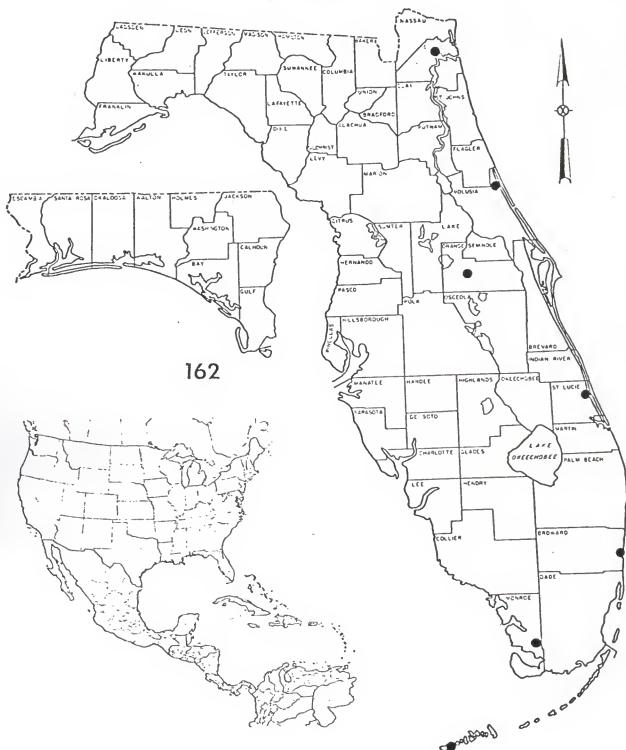


Fig. 163. Distribution map of Trupanea mevarna (Walker);
specific locality record (●), county record (■).

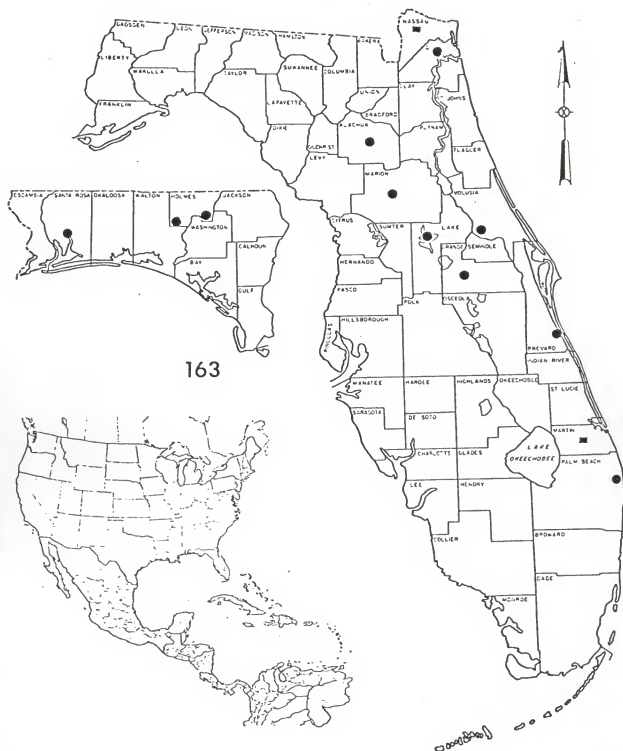


Fig. 164. Distribution map of Xanthaciura chrysura (Thomson);
specific locality record (●).

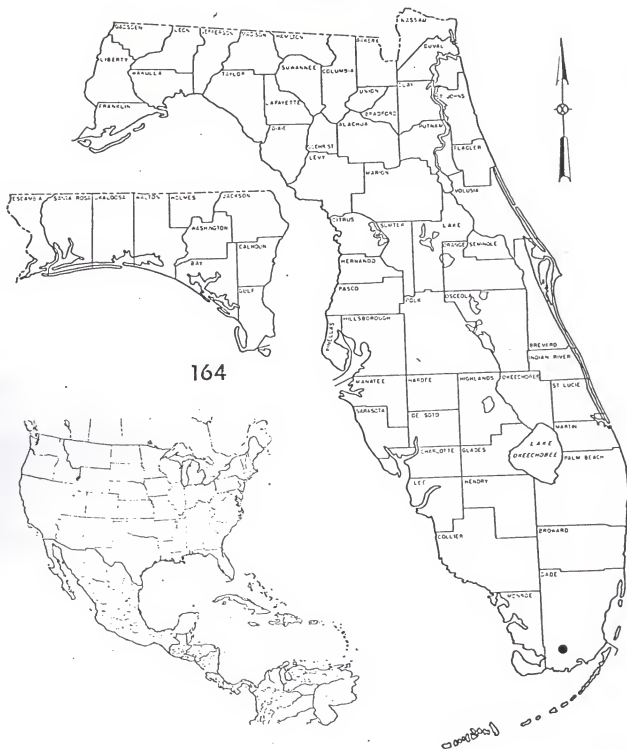


Fig. 165. Distribution map of Xanthaciura connexionis Benjamin
specific locality record (●), county record (■).

Fig. 166. Distribution map of Xanthaciura insecta (Loew);
specific locality record (●), county record (■).

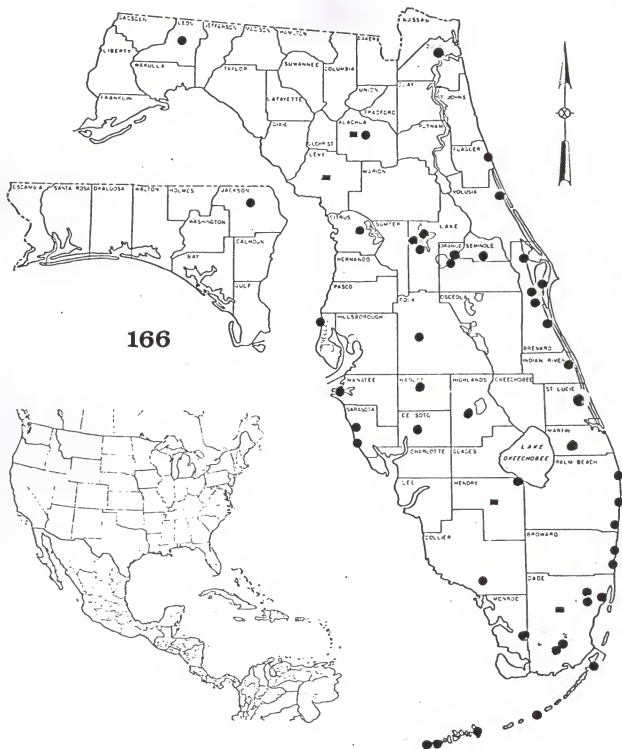


Fig. 167. Distribution map of Xanthaciura tetraspina (Phillips);
specific locality record (●).

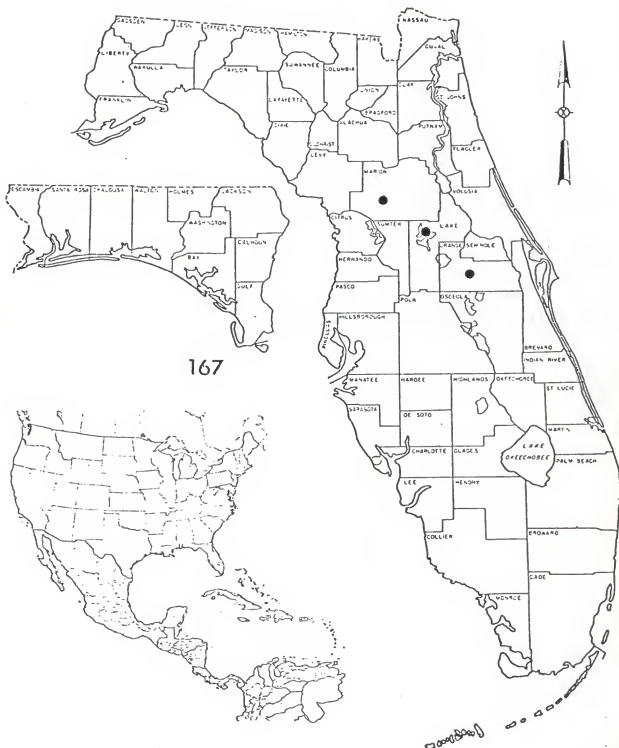
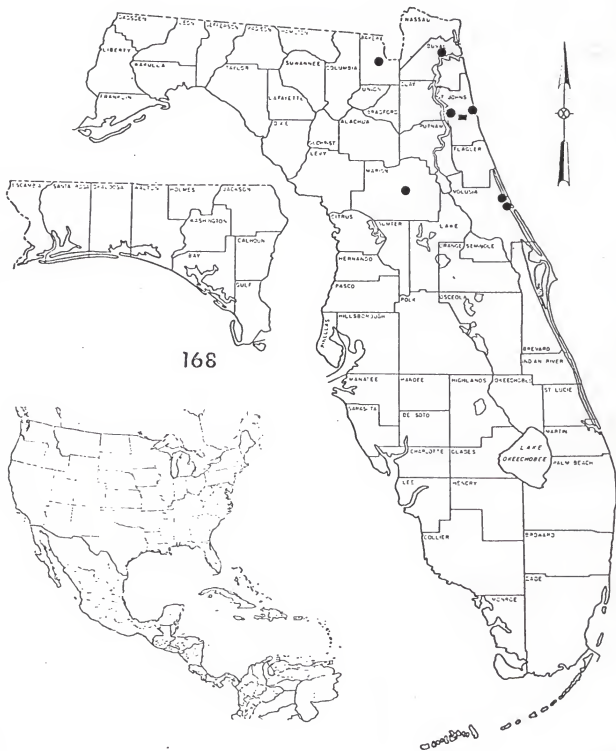


Fig. 168. Distribution map of Zonosemata electa (Say);
specific locality record (●).



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BIOGRAPHICAL SKETCH

Rohani Binti Ibrahim was born on December 13, 1950, in Pasir Mas, Kelantan, Malaysia. She received her secondary education from Sulta Ibrahim School in Kelantan. In May 1972, she graduated with a Diploma in Agriculture from College of Agriculture, Serdang, Selangor.

Prior to entering the University of Florida, she joined the Department of Agriculture, Kelantan, as an Agricultural Assistant. In September 1972, she entered University of Florida to begin work in Entomology with a scholarship from Public Service Department, Malaysia. She received the Bachelor of Science degree with honors in August 1974 and Master of Science degree in June 1976. In Fall 1976, she enrolled herself in a doctoral program with a scholarship from University of Agriculture, Malaysia. Currently, she is a candidate for the degree of Doctor of Philosophy.

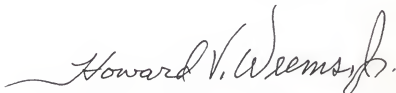
Rohani Binti Ibrahim is married to Yusoh Bin Salleh and has 2 lovely daughters, Sharila and Melissa Johannie. She is a member of Entomological Society of America.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



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Professor of Entomology and
Nematology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



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I certifiy that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



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I certify taht I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



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Professor of Plant Pathology

This dissertation was submitted to the Graduate Faculty of the College of Agriculture and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.



Dean of College of Agriculture

June 1980

Dean, Graduate School